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# The ELECTRICAL REVIEW

FOUNDED 1872

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*Advertisement Index, see page xl.* *Official Notices see Sup. 40.*

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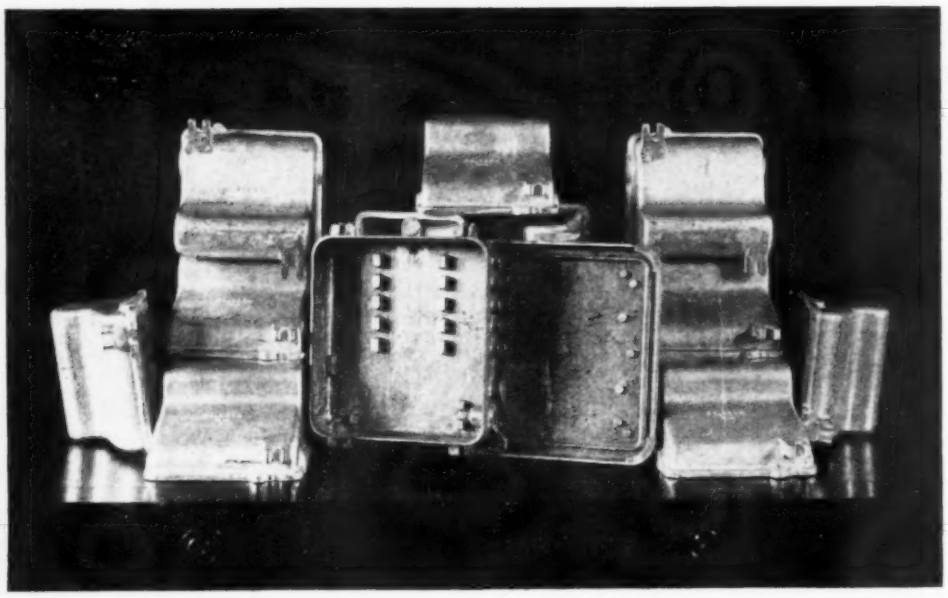

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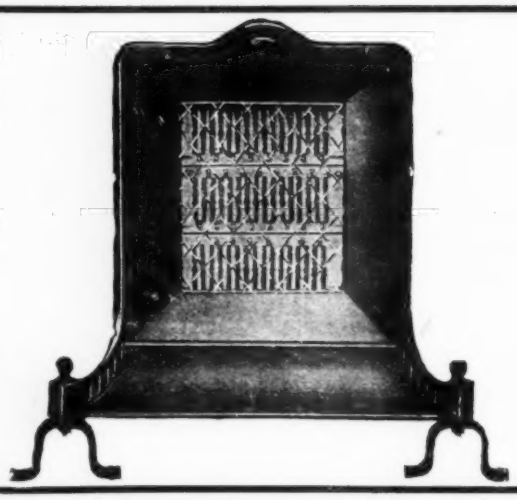

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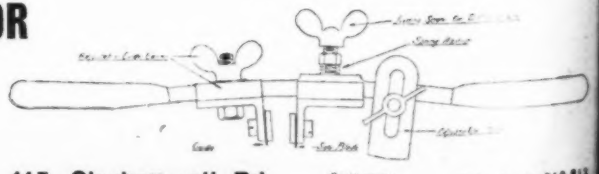

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The

# Electrical Review

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LIST OF FOREIGN AGENTS (see first page "Official Notices").

## Contents:

| | PAGE |
|---|---|
| "Buy British Goods" | 281 |
| A Personal Jubilee | 282 |
| Engineers' Salaries | 282 |
| Non-technical Explanations | 282 |
| Electricity as Used for Publicity | 282 |
| Installation Contractors in Sweden | 283 |
| The Railway Problem in Norway | 283 |
| The C.M.A. Exhibit at Wembley | 283 |
| Foreign Capital in Austrian Works | 283 |
| A Transmission-line Problem, by H. M. Lacey (*illus.*) | 284 |
| The Liffey Power Scheme, by R. N. Tweedy (*illus.*) (*concluded*) | 285 |
| Unemployment Insurance, by Jos. J. H. Stansfield | 287 |
| Legal | 288 |
| The Jubilee of Mr. Henry Alabaster | 289 |
| Parliamentary | 290 |
| Business Notes | 291 |
| Lighting and Power Notes | 294 |
| Tramway and Railway Notes | 295 |
| Telegraph and Telephone Notes | 296 |
| Radio Notes | 296 |
| Contracts Open and Closed | 297 |
| Forthcoming Events | 298 |
| A Jubilee Celebration—1874-1924 (*illus.*) | 299 |
| Industrial Developments in China, by H. A. Fleet (*illus.*) | 300 |
| The Sterling Telephone Works (*illus.*) | 302 |
| Notes | 303 |
| Institution Notes | 304 |
| Our Personal Column | 305 |
| New Companies Registered | 306 |
| Official Returns of Electrical Companies | 306 |
| City Notes | 306 |
| Stocks and Shares | 309 |
| Market Quotations for Chemicals and Metals | 310 |
| The French Physical Society's Exhibition (*illus.*) (*concluded*) | 311 |
| The West Riding (Aire and Calder) Electricity District | 312 |
| Salaries Paid in the Engineering Profession | 313 |
| Exports and Imports of Electrical Goods and Machinery in January, 1924 | 314 |
| Loud Speakers for Wireless and Other Purposes | 314 |
| New Electrical Devices, Fittings, and Plant (*illus.*) | 315 |
| Correspondence— | |
| Single-phase Induction Motors and the Starting Problem | 316 |
| Self-exciting Alternators | 316 |
| A Page-printing Telegraph | 317 |
| The Punjab Hydro-electric Scheme | 317 |
| Two-way Pendant Switch Flexibles | 317 |
| Squirrel-cage Motors of over 5 h.p. | 317 |
| Electric Water Heating | 318 |
| Electric Passenger Lifts | 318 |
| Plumbing Joints | 318 |
| A Libel on the Megger | 318 |
| What is a "Megger"? | 318 |
| Salesmanship | 318 |
| Electric Motors at Wembley | 319 |
| A Non-technical Explanation of Power-factor—II | 319 |
| Published Specifications | 320 |
| Contractors' Column | Advertisement page xxviii |

# "Buy British Goods."

SOME people have been supposing that as one outcome of recent political developments there would be a weakening of the predilection of the British for British-made goods. The placing of important locomotive orders abroad may be due partly to such a tendency and partly to the unwillingness of British builders to cut prices to a figure involving considerable loss in order to compete with the economic and financial conditions obtaining in foreign countries. If there be any weakening such as we have mentioned, perhaps it is as well that these locomotive incidents have arisen at such a time, for any Government or any public or private authority which desires to improve our industrial situation by reviving our trade must appreciate the necessity for stopping up the breaches in the wall through which the orders leak. It is passing strange that in a year when nearly everybody interested in British industry is engaged upon a costly enterprise at Wembley with a view to British trade expansion, there should be a renewal of the disposition to place British business with foreigners. Manufacturers who are affected will know well enough how far price considerations are to blame, and they will not grumble when they fail if they are not quoting strictly competitive prices, but they will do well to make full use of the propaganda weapon in favour of British products. There is nothing certain in the political outlook so far as the reduction of unemployment is concerned; the improvement in the figures is marked, and there is a growing confidence and optimism; in some quarters there are confident predictions of the approach of a boom in certain trades. We prefer for the electrical trade a continuous improvement rather than violent rises and slumps; what we are likely to witness is a continuous improvement at a greater pace—we do not anticipate a set-back electrically now whatever happens, but we cannot afford to drop our predilections for British goods however trade improves, for there is practically unlimited capacity in

our factories, and the nation has many unemployed workers. The preference for British-made goods must be encouraged rather than forgotten. Therefore we welcome very heartily the setting up of a committee of the Federation of British Industries to report upon the desirability of conducting a "Buy British Goods" campaign, especially in view of the holding of the British Empire Exhibition. The subject came before the F.B.I. Executive last December, and the committee has been set up after consultation with the secretaries of the various trade associations. The personnel of the committee is of importance, for it includes Mr. D. N. Dunlop, who as director of the British Electrical and Allied Manufacturers' Association, may be expected to represent British aspirations; also Mr. H. G. Williams, who represents the Machine Tool Trades' Association, whose members are, if we mistake not, exceptionally militantly British; further, Mr. D. A. Bremner, of the British Engineers' Association, which has watched over British engineering interests with marked consistency in season and out of season. Sir William Larke, another of the committee-men, also knows the British side of engineering interests. To the other members of the committee we need not refer, but we have said enough to suggest that first appearances favour the holding of such a campaign this year. Certainly nothing could be more appropriate when the great Exhibition is in progress, while we have so many unemployed, and when British industry sees clearer than ever that it must protect itself by its own measures and utilise to the full its own enterprise and its own resources.

**A Personal Jubilee.**

To make reference to a member of one's own organisation is admittedly unusual in journalism as it is practised in this country; we make no apology, however, for infringing the unwritten rule on so notable an occasion as the jubilee of the virtual founder of this journal, Mr. Henry Alabaster, to whom it unquestionably owed its safe navigation through the perils that beset its infancy and youth, and who, *primus inter pares*, shared with his two colleagues the responsibility of piloting it into smooth waters and the honour of keeping always flying at the mast-head the flag of integrity, truth, and justice.

The occasion is unique in technical journalism; we know of no other recorded instance in which for 50 years the same hand has held the rudder-lines continuously. Moreover, we know of no man more worthy of that distinction, more highly esteemed by the profession which he serves and (most difficult of all) by the staff that serves him, whose affection and trust are exemplified by the remarkable records of long service quoted on another page.

For reasons of health and weather, Mr. Alabaster preferred that the celebration of his jubilee should take the form of a domestic function, though, had it been permitted, a far larger gathering representing all electrical interests would have assembled to do him honour. As it was, every member of the staff was present, except three, who were absent through illness, and the result was a remarkable tribute of affection and admiration towards one whose temperament has made him averse to appearing in the limelight, but who nevertheless has exercised a great influence upon affairs.

The evening was a complete success, thanks to the excellence of the organising arrangements made by Mr. Ernest A. Gatehouse, who joined the ELECTRICAL REVIEW as joint-manager three years ago on the death of his father, Mr. T. E. Gatehouse, and is now one of the managing directors of the company.

**Engineers' Salaries.**

A CENSUS of salaries paid in the engineering profession has been taken by the Society of Technical Engineers, and the results, which are summarised elsewhere in this issue, will be found interesting. It appears that the young assistant of 22 years of age who is engaged in electrical manufacturing may expect to receive a salary of £150 a year, which will be doubled in about 10 years, and tends towards a definite limit of £400 which is practically attained in another decade. The prospects in engineering in general, even when the "plums" are included, are not much more rosy, the average being from 10 per cent. in the early years to 25 per cent. at 40, better than in electrical engineering, and tending to £555 as the maximum. Obviously, while some are more fortunate, others must be receiving much less than the average figures tabulated.

It cannot be said that such prospects are alluring, or that they compare satisfactorily with the rewards of those who take up medicine or follow the law; so long as this is the case, we cannot hope to attract the best men—in the sense of the cleverest—into electrical engineering. It is true that we do get the best class of man—the one whose heart is in his work, who would rather be an engineer and remain poor than follow a less congenial but more profitable calling. But is it right that these excellent fellows, artists of their kind, should have to satisfy their appetite for engineering at the cost of their stomachs? The cynic will say that it is fortunate—for their sons—that they are unable to train them to follow in their fathers' footsteps; but cynicisms don't solve problems. It is a fact, as pointed out by the Society, that paying a fair price for brains would not appreciably affect the cost of manufactured products—rather, by increasing efficiency, it would diminish the costs of production, and that is true whether the product be electrical energy or manufactured goods. We trust, therefore, that employers will study these figures and ask themselves whether their own staff engineers are adequately paid.

**Non-technical Explanations.**

THE interesting competition initiated by Mr. R. Amberton, of the Electrical Apparatus Company, has evoked some praiseworthy efforts, but to our mind has been but a qualified success. Few of the essays are either lucid or convincing, from the point of view of the layman; those put forward by Mr. Amberton himself most nearly complied with the specification, and had they not been *hors concours* would probably have headed the prize list.

The trouble appears to be that the competitors, being technical men, cannot get away from the technical view of the subject. Several of them simply attempt to transform the problem from electrotechnics to hydrodynamics or mechanics; others retain the electrical form and try to put the matter into "plain language," and several are hopelessly long-winded. As Mr. Turnbull remarks, the consumer does not want to be convinced, and will not read long articles. Our own selection for a medal is Mr. Amberton's argument which is printed in this issue. Any trader or manufacturer could readily follow the reasoning, and perceive the analogy. We regret that, holding the views which we have stated, we cannot find room to print other efforts, some of which are illustrated and would each exceed a column of our space.

**Electricity as used for Publicity.**

AN interesting discussion on this subject took place at a meeting of the Women's Engineering Society on February 5th, Mr. Leon Gaster presiding. Miss M. Partridge, who read the introductory paper, showed complete familiarity with modern show-window lighting and illuminated signs, and advocated the use of sound methods. The idea that shop windows should be lighted on lines similar to those adopted for the stage is now generally accepted in the leading stores, and during recent years there has been remarkable progress in the West End of London. Of course, many instances of glare are still to be seen in the less important streets, but the progress made suggests that they will be eliminated in course of time.

The use of illuminated signs demands not merely a knowledge of technique, but some insight into psychology. It was pointed out in the discussion that signs which serve to startle rather than attract fail in

their essential object, besides arousing hostility. There is much to be said for the view that it is better to avoid excessive contrasts and violent scintillations, and to aim at something rather more subdued and pleasing that not only attracts, but holds the attention. In particular, the element of novelty must be associated with the object it is desired to advertise. There are instances of devices so ingenious that public attention was concentrated entirely on "how they worked," and the actual message conveyed by the advertisement was entirely overlooked. Lighting effects appear to furnish a particularly suitable field for the efforts of the woman expert, and it is possible that her participation will suggest new points of view and have a useful effect.

**Installation Contractors in Sweden.**

THE position of installation contractors in Sweden was recently questioned, in consequence of newspaper allegations that the increased cost of carrying out this work in Gothenburg was due to the city electricity works having favoured a group of firms which had thereby been given a kind of monopoly of the work. The manager of the city electricity works, however, states that any semblance of a monopoly has disappeared. Special qualifications are demanded of contractors, who have been divided into three groups under the new system. It is incorrect to state that the work on new installations is reserved to the first group, as the other groups also have the same rights, at least with regard to dwelling houses. Some further light has been thrown on the problem as a result of an inquiry made at the offices of the Swedish Board of Trade in Stockholm. The chief inspector of the electrical department states that municipalities are quite free without State intervention to reach a decision of their own in the matter of installation work. The question, in his opinion, ought to be fully discussed in Gothenburg, and also in other towns where there may be a tendency to create a monopoly. For the rest, the problem was discussed in the Riksdag a few years ago, and the Board of Trade was commissioned to examine the question of electricity works and their "more or less improvised contractors."

The duty of the Board of Trade, the inspector says, is limited to the issue of certificates to contractors, which became necessary according to the ordinance of 1919. The ordinance stipulates for the possession of a certain theoretical knowledge as well as practical, but it has obviously been impossible for the State to prohibit the continued exercise of their trade by all those who had carried on the business before 1919, except in the event of proved incompetency. Under these circumstances, the Board of Trade has granted a number of dispensations from the rules during the present period of transition. In the particular case of Gothenburg, and certain other towns, the inspector remarks that it is possible that the action of the electricity works is prompted by the wish not to let undesirable firms slip into the business and lower the standard of work. The practice in this respect in Stockholm has been very strict for a long time past, and only about 20 firms have been privileged in the matter. In conclusion, the inspector states that, in his opinion, free competition is most advantageous for the community.

**The Railway Problem in Norway.**

SEVERAL months ago the Government of Norway dispatched a committee of engineers, headed by Prof. Jacobsen, of the Christiania High School, to the United States in order to investigate the conditions of electric railway working in that country. The committee recently returned to Norway, and the professor has given publicity to the results of the inquiry. It is stated that the committee inspected all the railways which lead out of New York, which are electrically equipped, with the single exception of a goods line; this, however, it is intended also to convert to electric traction. An examination was also made of a number of electric railways in the district of Philadelphia and in Virginia. An extraordinary amount of traffic has to be handled in the latter State, the transport representing about 50,000 tons per 24 hours. The line, which has some heavy gradients, has locomotives of up to 6,000 h.p. In addition, loads of from 3,000 to 12,000 tons are to be hauled on an adjoining line by locomotives of up to 25,000 h.p.

Besides the electric railways, the committee paid visits to the engineering workshops where electric locomotives are constructed. Everywhere in the United States, the professor says, exceptionally great satisfaction is expressed with electric train working, both from an economic and a technical point of view. Electric locomotives can be built much more powerful than steam types, and have proved to be more reliable and to require less repairs. In conclusion, the professor states that, judging from what he had seen and heard in Switzerland and Italy in 1922 and now in the United States, it is his personal opinion that not a single line ought to be constructed in Norway in the future except for electrical working.

**The C.M.A. Exhibit at Wembley.**

WITH characteristic enterprise and thoroughness, the Cable-Makers' Association is well ahead with the erection of its extensive stand in the Palace of Industry at the British Empire Exhibition. The example is one which should be quickly followed by others who intend to occupy the spaces which as yet show no signs of life. Surely it is high time for everybody to "get a move on" if we are to have things quite ready by the opening day. How often has the first week and more been practically wasted because exhibitors and their contractors have acted far too long as though there was "still plenty of time," with the result that there has been hurry and flurry at the last, and even the completion of stand erection and the blocking of gangways with packing-cases after the opening day.

**Foreign Capital In Austrian Works.**

As one of the principal economic assets of Austria lies in the possession of large water-powers, efforts have for some time past been made in order to bring these sources into profitable utilisation. Financial difficulties have been the greatest obstacle in the way as under prevailing circumstances adequate funds could not be raised in the country itself, and the attempts to secure foreign capital failed until recently when the Italian Castiglioni group took up a share in the Styrian Water Power and Electricity Company, of Graz. This example has since been followed by Swiss financiers who have also become interested in the Upper Austrian Water Power Company. The participation of the Italian element evoked much comment, because some apprehensions were manifested that this step might lead to the undertaking coming under foreign control. On the other hand, the Italians submitted that it was inconsistent to ask for foreign assistance and then, when it was offered, to raise fears of external control.

In the particular case of the Styrian water powers, two groups are concerned, namely, a group of Austrian banks and the Italian group, and these two have now reached an agreement for a period of 13 years. This provides for the equal representation of the two groups on the board of directors of the Styrian company, and it also applies to the allocation of orders for the machinery and plant required for the works. If the prices are the same as those of foreign works, Austrian firms will be given the preference in the placing of the orders, thus fully assuring their interests.

As far as the Swiss element is concerned, it appears that a new company has been formed at Basle, as a holding company, under the title of the Electrowerte A. G. (Valeurs d'Electricité, Société Anonyme), although the participation of this concern relates to the Styrian undertaking already mentioned. The company has a share capital of 20,000,000 fr., and is also raising two loans of 6,000,000 fr., and 9,000,000 fr. of the 4½ and 5 per cent. types respectively.

D

# A Transmission Line Problem.

By H. M. LACEY, B.Sc., A.K.C., A.M.I.E.E.

IN the issue of the ELECTRICAL REVIEW dated September 21st, 1923, a correspondent submitted the problem of how to obtain graphically the pressure at the receiving end of a transmission line, given the power taken and the power factor at the receiving end, the pressure at the sending end, and the line constants.

For a reason explained later, the writer does not consider that a simple graphical solution is possible, but the following method is perhaps of interest.

Let E = Line pressure at sending end.
$E_r$ = Line pressure at receiving end.
K = Load at receiving end in kVA.
$\phi$ = Angle of lag at receiving end.
R = Resistance per phase in ohms.
X = Reactance per phase in ohms.

In solving the problem graphically, it is best to use the same scale for volts and amperes, as this enables pressure drops to be obtained by simple multiplication.

In the diagram let the horizontal axis OD represent the vectorial direction of the current. With centre O and radius $E/\sqrt{3}$ describe an arc ABC.

Draw a line OB making an angle $\phi$ with OD. From any point D on OD mark off—

DE equal to OD × R, and erect a perpendicular
DF equal in length to OD × X. Then the triangle
DEF is a vector diagram of the resistance, reactance and impedance pressure drops for a current represented in magnitude and direction by the line OD.

Now plot the curve GMK from the equation—

$$xy = 1{,}000\ K \sin \phi/3.$$

From points $L_1$, $L_2$, &c., taken at intervals along OB draw lines $L_1A_1$, $L_2A_2$, &c., parallel to EF, and lines $L_1M_1$, $L_2M_2$, &c., parallel to OD to meet the curve GMK at $M_1$, $M_2$, &c.

From $M_1$, $M_2$, &c., draw lines $M_1N_1$, $M_2N_2$, &c., parallel to the vertical axis OH, to meet the line OF at $N_1$, $N_2$, &c.

From $N_1$, $N_2$, &c., draw lines $N_1P_1$, $N_2P_2$, &c., parallel to FE to meet OD at $P_1$, $P_2$, &c.

Along $L_1A_1$, $L_2A_2$, &c., mark off lengths $L_1A_1$, $L_2A_2$, &c., equal in length respectively to $N_1P_1$, $N_2P_2$, &c.

Draw a curve through $A_1$, $A_2$, &c., cutting the arc ABC at A.

Draw AL parallel to FE cutting OB at L.

OL is the pressure to neutral at the receiving end.
OA is the pressure to neutral at the sending end.

Also if LM be drawn parallel to OD cutting the curve GMK at M, and MNR be drawn parallel to OH cutting OF and OB at N and R respectively and NP be drawn parallel to FE cutting OD at P,

then OR is the current per phase,
RP is the resistance drop per phase,
NR is the reactance drop per phase,
NP is the impedance drop per phase.

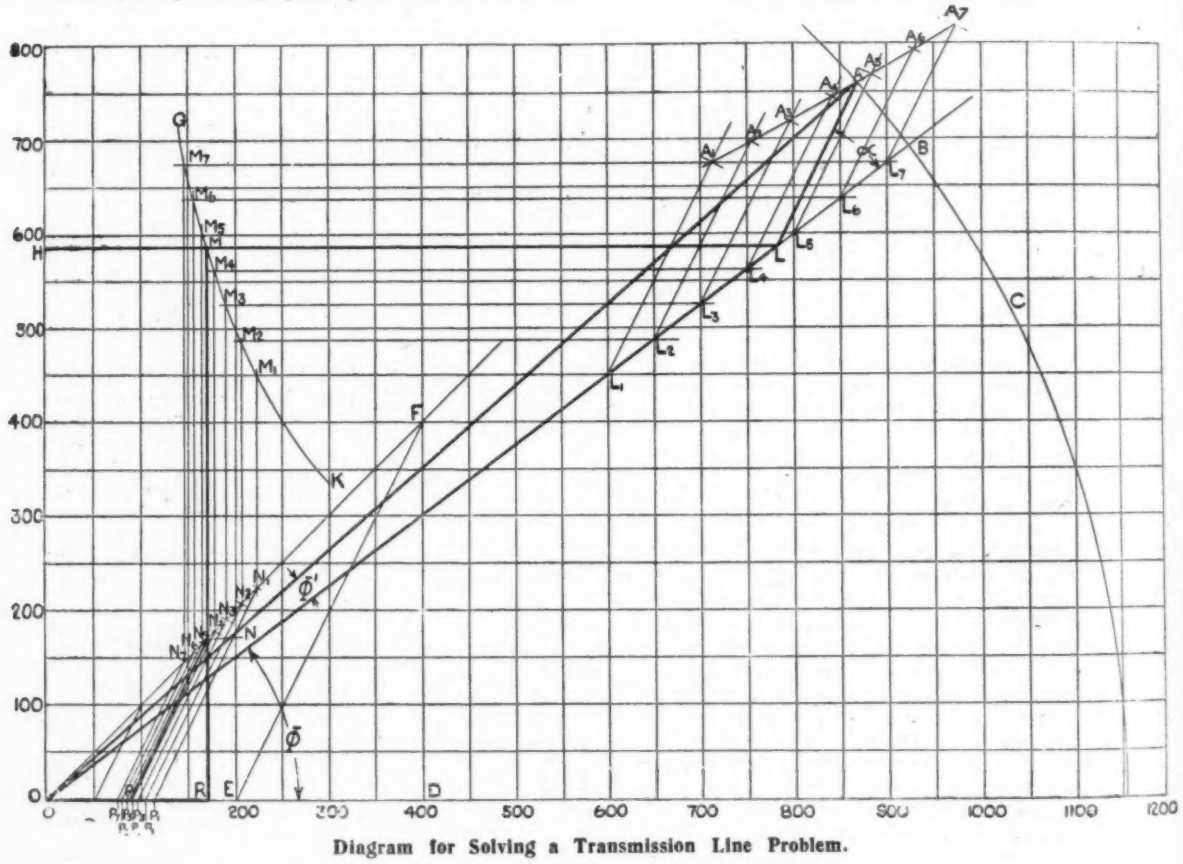



Diagram for Solving a Transmission Line Problem.

That this procedure is correct is almost self-evident, for from the construction AL is equal to and parallel to NP, and it is also apparent that since FE was constructed to represent the impedance drop for a current OD, then by similar triangles, NP must represent the impedance drop for a current OR. Also—

$$OR,\ OH = 1{,}000\ K \sin \phi/3.$$
$$OH = OL \cos (90 - \phi) = OL \sin \phi.$$
$$\therefore\ OR,\ OL = 1{,}000\ K/3.$$

Thus OL is the voltage corresponding to the current on for a given power per phase of $\frac{K}{3}$ kVA, that is, for a total power of K kVA.

The diagram is drawn to scale for the following conditions:—

E = 2,000 volts. R = 0·5 ohm.
K = 500 kVA. X = 1·0 ohm.
$\phi$ = 36° 50′ cos $\phi$ = 0·8.

By measurement OL = 980,

$$E = 980 \times \sqrt{3} = 1{,}700 \text{ volts.}$$

The angle of lag at the sending end may be measured by means of a protractor, and will be found to be approximately 41° 20′. Thus the power factor is 0·75.

It will be seen that the method is somewhat tedious, although the work of plotting the curves may be shortened by obtaining an approximate value for the current, from an assumed receiving pressure.

It is doubtful whether it is possible to obtain a solution which does not necessitate the plotting of curves, since the algebraical solution involves a quadratic equation.

The formula which is commonly used for solving this problem may be simplified by taking it in steps, and it is of interest to see how these steps are obtained by considering the algebraical solution.

Using the same symbols and diagram as before, in the triangle OAL—

$$OA = E/\sqrt{3}.$$

$$OL = E_r/\sqrt{3}.$$

$$AL = K \times 1000 \times \sqrt{(R^2 + X^2)}/\sqrt{3} \times E_r.$$

$$\text{Angle } a = 90° - \phi - \tan^{-1} R/X.$$

Let $K \times 1000 \times \sqrt{(R^2 + X^2)}\,1\sqrt{3} = M$,

then $AL = M/E_r$.

By trigonometry—

$$OA^2 = AL^2 + OL^2 + 2\,AL.\,OL.\cos a.$$

$$E^2/3 = M^2/E_r^2 + E_r^2/3 + 2\,M/E_r \times E_r/\sqrt{3} \times \cos a.$$

$$E_r^4 - (E_r^2 - 2\sqrt{3}\,M\cos a)\,E_r^2 + 3\,M^2 = 0.$$

Let $E^2 - 2\sqrt{3}\,M\cos a = N$.

$$E_r^4 - N\,E_r^2 + 3\,M^2 = 0.$$

$$E_r^2 = \tfrac{1}{2}\,[N + \sqrt{(N^2 - 12\,M^2)}].$$

The remaining solution, $E_r^2 = \frac{1}{2}\,[N - \sqrt{(N^2 - 12\,M^2)}]$ gives a value for $E_r$ equal to the impedance drop and is introduced through the original equation being homogeneous with respect to AL and OL. This solution may therefore be neglected. The correct solution becomes—

$$E_r = \sqrt{\tfrac{1}{2}}\,[N + \sqrt{(N^2 - 12\,M^2)}].$$

The angle $\phi'$ between the sending and receiving pressure may be obtained thus—

$$\sin\phi'/OA = \sin a/AB$$

or $$\sin\phi' = M\sqrt{3}/E_r\,E \times \sin a$$

Summarising these equations in the order they should be used in working out numerical examples—

(1) $$a = 90° - \phi - \tan^{-1} R/X.$$

(2) $$M = K \times 1{,}000 \times \sqrt{(R^2 + X^2)}/\sqrt{3}$$

(3) $$N = E^2 - 2\sqrt{3}\,M\cos a.$$

(4) $$E_r = \sqrt{\tfrac{1}{2}}[N + \sqrt{(N^2 - 12\,M^2)}].$$

(5) $$\sin\phi' = M\sqrt{3}/E_r\,E \times \sin a.$$

If these equations be applied to the example taken for the graphical solution the following values are obtained:—

$a = 26° 40′.$ $\quad E = 1{,}700.$

$M = 3{\cdot}23 \times 10^5.$ $\quad \phi' = 4° 15′.$

$N = 3{\cdot}00 \times 10^6.$

The only difficulty in using these equations is the magnitude of the numbers involved, and the risk of error due to this may be minimised by expressing these numbers in the form given for M and N above—that is, with a single figure to the left of the decimal point and a power of ten as a multiplier.

# The Liffey Power Scheme.

By R. N. TWEEDY, M.I.E.E.

(*Concluded from p. 245.*)

Ireland is crying out for someone to break the ice on the peat bogs, and this scheme would do that effectually. The power station would be placed adjacent to 2,000 acres of 30-ft. peat through which a branch of the Grand Canal runs already, thus providing cheap transport between Dublin and the site. Moreover, the canal towpath offers the best and cheapest route for the transmission line from the peat station. The line from the Golden Falls station would join up with the canal route at Sallins, and the line from Leixlip would also connect with this route at Lucan.

During an aggregate of 26 weeks of the year it is believed that the demand can be satisfied by water power alone, upon the assumption that peak is added to peak on the four Dublin stations, representing a total of 14,000 kW. In the dry periods the normal eight-hour load would be taken by the peat station, peaks being taken by water accumulated in the two reservoirs. It is estimated that a complete week of zero flow would not overtax the system. At other times the load would be split between water and peat in such a way that the greatest possible use would be made of the water.

Surplus energy at any of the stations would be applied to some industrial purpose at the peat station, such as the manufacture of artificial fertilisers.

Peat would be won at the outset entirely by contract with the existing turbary holders, but the company would have to organise machine cutting on modern lines before long. It is anticipated that hand-cut peat would be delivered at the power station for 13s. 4d. per ton, and that there would be a set-off of 8s. per ton on sale of by-products.

At this peat station a beginning would be made with four sets each of 1,500 h.p., having a normal full-load output of 4,000 kW.

Transmission would be effected at 33,000 volts from the step-up transformers at all stations, and entrance to the city would be at Dolphin's Barn.

The capital cost, including compensation and all works, has been worked out closely from actual quotations, and is stated to be £600,000, of which the cost of the peat station is £135,000.

The position in Dublin with respect to generating plant is certainly no better than that in most cities where the demand is always growing at an increasing rate. The Corporation of Dublin, for instance, is now advertising for an additional 5,000-kW of plant, and the townships of Rathmines and Pembroke are probably in a similar position. From that point of view, therefore, any scheme which offers a short period of construction may have a considerable advantage over others that need double the interval between starting work and giving a supply. Herr Buchi considers that a period of three years under favourable conditions would complete his scheme, but 12 to 15 months is suggested as the time required for the water-peat scheme. Possibly both are under-estimates, but the ratio is probably nearly correct. Certainly power could be delivered from the peat station in the time, and an additional 4,000 or 5,000 kW would be extremely valuable in 1925, with another 15,000 kW coming in during the winter, 1925-26.

### Power Demand.

Herr Buchi estimates, upon data supplied by Mr. Laurence Kettle, that the annual expansion of demand, excluding the tramways, will be about 10 per cent. Hence the consumption in 1931 will be double that of 1921. On the other hand, the peak load should not increase by more than 6 per cent. per annum. Moreover, the increase will be at a greater rate in summer

than in winter, as the lighting demand is said to be nearly satisfied, but the power demand is not.

The tramway demand will improve the load factor considerably, and the probable rate of increased consumption is about 2 per cent. per annum on the present tramway demand.

The combined tramway and lighting and power peaks, which were about 15,000 kW in 1921, will reach 22,500 kW in 1931, and the average yearly load of 3,700 kW in 1921 will rise to 6,000 kW in 1931.

It is estimated that the total consumption for all purposes in 1931 will be 52.5 million kWh at the step-down transformer station. Of this the water stations will supply 41.5 million kWh, leaving 11 millions to come from the steam reserve. Supply from the latter source would extend over five months in 1931.

### Cost of Production.

On the basis of similar undertakings in Switzerland, Herr Buchi has calculated the probable total costs of the combined steam and water stations as follows:—

(*a*) Hydro-electric stations alone:—

| | | |
|---|---|---|
| Interest ... ... ... ... | 6% | on capital outlay |
| Renewal fund ... ... ... | 1·4% | " " |
| Sinking fund ... ... ... | 0·6% | " " |
| Taxes, operation, and maintenance, including overhead charges ... | 0·7% | " " |
| Total ... ... | 8·7% | " " |

8·7% on £1,130,000 = ... ... ... £98,000

(*b*) Steam reserve:—

Present capital value of plant ... £400.000

Interest, sinking fund, operation costs (coal at 23/-) and overhead charges ... ... 1·5d.

11,000,000 kWh at 1·25d. = £57,000

Total cost of combined operation in 1931 = £155,000

Cost per kWh in 1931:—

| | Operating costs. | kWh delivered at step-down transformer | Cost per kWh |
|---|---|---|---|
| Water ... | £98,000 | 41,500,000 | 0·57d. |
| Steam ... | £57,000 | 11,000,000 | 1·25d. |
| | £155,000 | 52,500,000 | 0·71d. |

Cost in 1926 (assumed date of completion, now impossible).

| | | | |
|---|---|---|---|
| Water ... | £98,000 | 41,500,000 | 0·57d. |
| Steam ... | £45,000 | 3,000,000 | 3·60d. |
| | £143,000 | 44,500,000 | 0·77d. |

It is evident, therefore, that the total cost of production and transmission, under the conditions specified, depends only slightly upon the extent to which the steam plant is used for dealing with peak loads, or as a reserve.

It is important to remember that these figures do not represent the price to the consumer, for that has to include also the costs of distribution, which are somewhat heavy in Dublin. In fact, Mr. Kettle, speaking in public recently, held out no hope that bringing Liffey power to Dublin would make any considerable reduction in the price of energy.

If it should happen that the tramway company elected to stand out of this scheme (although in its case the cost of distribution is its own, not that arising out of the city network, and it looks as if it could buy power at the step-down transformer for three-farthings a kWh, or under), the cost of energy delivered at the city boundary would be 0.95d. in the first year of operation, 0.74d. in 10 years' time, when the Leixlip station came into delayed action, and 0.72d. in another five years afterwards.

As the tramway station is full of obsolescent plant, although by good engineering the best is made of it, and as it is rumoured that sweeping changes are contemplated, it is to be hoped for the sake of the Dublin consumer that the company will support the Liffey scheme with its custom.

The figures given above must be taken, within certain limits of error in the estimation of capital cost, to represent the cost of energy delivered in bulk at the city boundaries by any concessionaire whatsoever who proposes to develop the Liffey on the lines of Herr Buchi's scheme.

The water-peat proposals enable more favourable production costs to be attained, according to the estimates of the Syndicate. The percentage of net profit earnable at various load factors has been worked out, and the figures below record the results of these calculations. Ten per cent. can be earned on the sale of 15 million kWh at 1.8d., on 20 millions at 1.33d., on 30 millions at 0.90d., and on 40 millions at 0.66d. (see diagram).

On the estimated maximum demand the load factors will be:—

| Millions of kWh sold... | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|
| Load factor ... ... | 16·3 | 20·4 | 24·4 | 28·5 | 32·6 |

If the calculations and estimates of this company are of the same order of accuracy as that of other schemes, there is a strong case for them.

It is understood that Bills covering all schemes for the development of the Liffey had to be deposited by the middle of January, but at the time of writing they have not come before either House. The procedure in every case is by private Bill, and a question must arise in an acute form immediately as to the competency of any legislative body to discuss such highly technical competing Bills, and to decide upon their merits. As time is the essence of the matter, it is singularly unfortunate that the Government has to begin now to construct

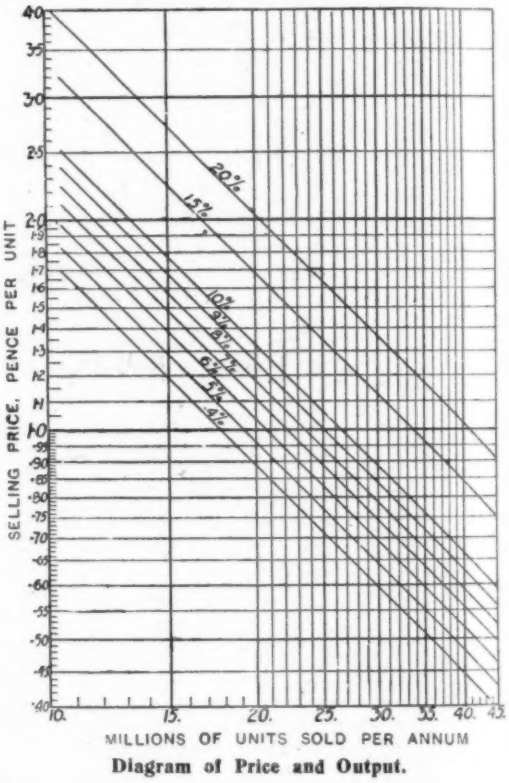



**Diagram of Price and Output.**

machinery for dealing adequately with proposals for exploiting the natural resources of the country. It must do so, because it is impossible to do justice to the community in any other way, and the inevitable result will be the postponement of action already overlong delayed, until the proposals have been submitted to the most searching examination by a committee of independent experts. It is only upon the considered findings of such a body that the Legislature can proceed to perform its essential function.

The Liffey scheme is but the beginning of power development large and small from every native source, and it would seem desirable to follow broadly the lines on which the Governments of Continental and American countries have been working for many years.

The thing to be dreaded most is the failure either technically or financially of the first great scheme to be put forward in the Free State. It may not be great in relation to the vast power developments elsewhere, but it is great from the Irish point of view, and by its success or failure future projects will be affected out of all proportion to its absolute magnitude. According to the Electricity Commis-

sioners' returns for the year ended March 31st, 1923, the whole of the electricity generated from water power by authorised undertakers in Great Britain is rather less than the quantity which can be supplied from the Liffey in the first year of operation. On the basis of the best fuel consumption record, namely 2 lb. [1.7 lb.—EDS.] per unit at Carville, which, of course, is a very low figure for the comparatively small Dublin stations, this means reducing the importation of coal by 30,000 tons per annum. The actual figure would be at least double this, and would improve as the demand increased.

The position is delicate for two main reasons. In the first place, a concessionaire other than the Dublin Corporation may if he secures the necessary statutory authority ignore Dublin altogether, if he finds negotiations too difficult. He would proceed then to develop the power sites at a rate consonant with the demand which would be built up outside Dublin. Having thus contracted out of loading the price of energy with the charges on plant values and of distribution costs within the city, he could offer the inducement of really cheap power to manufacturers. That would tend, in the long run, to shift the industrial centre outside the Dublin rateable area, and would lead to intensified activity upon the extra-mural roads, railways, and canals. Probably there is no legal restriction upon the tramway company not to buy as much energy as it likes outside the city and to distribute it over its own intra-mural system. That alone would warrant the concessionaire in proceeding at once with the complete scheme.

Alternatively, the Dublin Corporation will be assumed to control the situation politically so that no concession would be granted without the stipulation that the needs of the city had a prior claim. In that event it is possible that the Corporation could earmark the whole available supply from the Liffey scheme. In any case the concessionaire who wishes to start with an assured market for his whole output must secure both the Corporation and the tramway company as customers, and, in order to do that, he must bear in some way the charges on plant put out of service in both systems. That applies equally to the townships of Rathmines and Pembroke, each with its own municipal station.

Mr. Kettle's solution is both broad-minded and practical. He suggests that all interests shall be pooled by the formation of a controlling Electricity Board for the Dublin area. Development then would take place not as a municipal or as a private concern, but somewhat in the nature of a communal enterprise run without profit in the commercial sense so far as generation and transmission were concerned. Each interest would have weight in proportion to its financial liability or in some other equitable manner to be determined, and there would be no question of domination at any time by an electricity committee or by a council.

The distribution of electricity would remain in the hands of the present local authorities, and any profit to be made would accrue from that part of the business.

There is another aspect of the case which demands consideration, and it is the most important of them all.

The Liffey scheme has definite limitations, probably of the order of 50 million kWh per annum. If demand grows at a greater rate than 10 per cent. per annum when the area served is as greatly extended as the new scheme will enable it to be, it must be made possible to link up the Liffey stations with other sources. Ultimately, one hopes, these Liffey stations would form part of a national network fed by water-power, by peat, and by coal stations in every province. Even at the outset Herr Buchi has shown that assistance will be required from the steam reserve in Dublin, and one of the competing schemes proposes, as we have seen, to begin with an interlinked system. Nothing that is done now must be permitted to obscure this wider aspect, and it is quite definitely the business of the Government to safeguard the rights of the whole nation in this matter.

At the moment the most desirable course seems to be to reorganise entirely the steam reserve within the city by concentrating the most modern plant of the Corporation and the tramway company at the site of one or the other as may be determined to be most economical; to alter the boiler settings to enable native coal to be burned, possibly in pulverised form; to sell the obsolescent plant at both stations; and to run the remainder under the best possible conditions in conjunction with the Liffey power stations.

If the water-peat combination should find favour the Government might well take a direct financial interest in the peat end of the scheme, because everyone in Ireland who really knows anything about the production and use of peat in Canada, Italy, Russia, Germany, Sweden, and other countries, has been clamouring for an Irish experiment on a big scale, which would lead either to the rapid extension of bog-area reclamation, or to its abandonment as a lost cause.

# Unemployment Insurance.

By JOS. J. H. STANSFIELD.

AN exhaustive and interesting report has just been sent by the National Confederation of Employers' Organisations to Mr. Shaw, the Minister of Labour.

In November, 1922, the then Minister (Sir Montague Barlow, Bart.) invited the co-operation of the Confederation and the Trades Union Congress General Council as the bodies most representative of employers and employed to consider what steps might be taken to establish an improved system of unemployment insurance.

The Council representing the employés have not yet reported as a whole though many Trade Unions have sent in replies, and it is now intimated that the employers have considered the matter, and their report will be found well worth careful perusal.

The Confederation appointed a strong Committee, including Lord Weir, Sir Andrew Duncan, and Messrs. Evan Williams, Lithgow, Roscoe Brunner and Milne Watson, and their report is noteworthy in that this is the first occasion when employers as a whole have expressed a considered opinion on the Unemployment Acts, or indeed on any social question of similar magnitude. This is an excellent omen for the future well-being of industry, and is a distinct advance towards the full recognition by employers that social considerations have an important bearing on the development of trade and industry.

During the latter part of the 19th century the feeling grew that distress arising from want of employment should be met in some other way than by Poor Law Relief, and in 1911 an Act was introduced to deal, not with the whole problem, but with certain classes of workmen who were the most likely to be thrown out of work in consequence of fluctuations in our industrial system.

This Act only dealt with about two million workpeople, but in 1920 a further Act was passed which applied the system to nearly six times that number out of a total industrial population of 15 millions. This Act contained various insurance safeguards which have been temporarily suspended owing to the severe depres-

sion of the last two or three years which has necessitated the introduction of emergency measures.

How severe this depression has been may be gathered from the fact that the payments made during 2½ years under the Act of 1920 supplemented by these emergency regulations and by outdoor relief from the Poor Law Authorities to insured workers and their dependents have amounted to over £150,000,000.

Under the Act of 1923 the permanent principles laid down by the Act of 1920 will be freed from all emergency provisions as from October, 1924, and once this is effected it will enable experience to be gained which may lead to a fuller development in the light of permanent conditions. Emergency measures may still be at times necessary, but the Employers' Confederation recommend that these should be in the form of an *ad hoc* State provision.

The principle of compulsory insurance against unemployment has in the main been accepted; it has become a permanent part of the country's social system, and criticism has been mainly directed against the system of a flat rate of contributions and benefits, and the part that the State should take in contributing towards finance and in controlling administration.

The Geddes Committee suggested that insurance should be developed along the line of each industry having its own scheme. The Confederation of Employers rule this out on the ground of its impracticability; in their view it is impossible if for no other reason because there is no definite demarcation between industry and industry. Furthermore, industries dependent upon world markets suffer more severe fluctuations than home trades, and if industry insurance were adopted the former could not offer the advantages which could be given by the industry with low fluctuations, and unrest would be created in consequence of the disparity between contributions and benefits.

The industry with severe fluctuations would necessarily have to pay higher contributions for equal benefits. On the other hand, those engaged in industries with low fluctuations have demurred at flat rate payments because a large proportion of their contributions has gone towards relieving other industrial workers.

The Confederation are definitely against individual industry schemes; their view is that all industry is inter-dependent and though the incidence of trade depression and unemployment may fall very unequally, unemployment insurance must, if compulsory, be universal and uniform.

On the other hand, they see no objection to lower risk industries making voluntary provision for advantages additional to those of the National Scheme by means of supplementary schemes as contemplated by Section 20 of the Act of 1920.

In the report consideration is given to the question of finance. In recent years the proportions of contributions annually made have been: employers 19 millions, workers 17 millions, and the State 13 millions of pounds. The Confederation recommend that the State should pay the same rate as the employer and the worker.

The State would thus become an equal partner for finance and a senior, in fact almost the sole partner for management and administration.

When the national system of unemployment exchanges was established in 1909, it was contemplated that one of the functions of the Labour Department would be to act as a kind of intelligence bureau co-ordinating and distributing Government and Municipal contracts so as to regulate unemployment, but this policy has not matured. Efficient administration is only possible if there is also efficient organisation in the whole field of unemployment with proper devolution for local requirements and proper co-ordination with other social services.

It may be that industry is not yet prepared for compulsory notification of vacancies to the exchanges or compulsory registration of workers at the exchanges, but the Confederation see no reason why employers should not be compelled to intimate the engagement of workers, though in the case of casual employment a special arrangement would be required.

The subject of local administration was not fully discussed though it is felt that local committees on the present basis cannot be given executive or administrative powers. In our social services valuable work is being done by voluntary effort, and it may be that if this effort can be extended to the question of unemployment, great good may result. An intimate knowledge of industry and its conditions supplemented by the experience gained by those responsible for the exchanges would be of assistance not only to those who administer the exchanges but also to those employers who recognise the social obligations which appertain to industry.

In particular this can be directed to the question of employment for juveniles so that the rising generation may be directed to those trades which are not overstocked and not declining. It is surely worth while to take measures which will reduce the number of unskilled workers who, when employment is hard to obtain, are often the first to suffer and to be thrust into the category of workers casually employed for causes over which they can exercise no control.

Suggestions have been made that unemployment insurance should be amalgamated with the social services, but the Confederation point out that unemployment insurance is not so related either in principle or in substance with health insurance, workmen's compensation, or old age pensions as to make amalgamation desirable. What is needed is co-ordination between unemployment insurance and poor law relief, so as to prevent overlapping and confusion, and to ensure that both thrift and charitable aid are preserved as part of the general scheme, and in this connection the conclusions of the Royal Commission of 1909 on the Poor Law should be reviewed in the light of the experience of unemployment insurance since 1911, and more especially during the last three years.

# Legal.

### North of Scotland Electric Light and Power Co. v. Montrose.

A SETTLEMENT has been effected of the action raised by the above company against the town of Montrose as nominal defenders. The action was in consequence of damage done to the company's cable in High Street, Montrose, in the course of repairing the street, whereby the lighting of a large part of the town was interrupted. Defenders have paid the company's account for repairing the damage, £93, together with costs.

### O'Driscoll v. Marconi Wireless Telegraph Co., Ltd.

ON Monday the Court of Appeal dismissed the appeal of Mr. Florence O'Driscoll from the judgment of Mr. Justice Bailhache in his action against Marconi's Wireless Telegraph Co. for breach of agreement of employment in Argentina. The case was reported in our issues of November 9th and 16th, 1923.

### Dale v. Igranic Electric Co., Ltd.

IN the Court of Appeal on February 13th the appeal of the defendants from the judgment of Mr. Justice Swift was heard. The case related to an alleged breach of agreement by the defendant company by which they were to take space at an exhibition at Westminster in 1922. The matter has already been reported here.

At the conclusion of the arguments of counsel, their Lordships held that Mr. Dale had not substantiated his claim to the damages he maintained he had suffered from any breach which the defendants might have committed, and they held that in the circumstances the £100 must be treated as a penalty and not liquidated damages. They accordingly held that Mr. Dale succeeded on his claim for £5 5s. outstanding rent, but there would be no order for costs on that issue.

The appellants were awarded the costs of the appeal and the costs of the issue with regard to liquidated damages.

### Charge Against H. H. Oxley.

*The Times* reports that at Bow Street Police Court, on February 15th, before Sir Chartres Biron, Henry Hallifield Oxley, 40, electrical engineer, stated to be an official of the York City Corporation, of Bootham, York, was charged on remand with obtaining credit to the extent of £140 from Mr. Harry Merrin, London manager of Messrs. Matthews and Yates, engineers, of Swinton, Manchester, without dis-

closing that he was an undischarged bankrupt. Mr. Stallon defended. "Mr. H. A. K. Morgan, for the Director of Public Prosecutions, said it was probable that other charges would be preferred at a future hearing. The defendant formerly traded as Oxley & Co., electrical supply engineers, Bridge House, Queen Victoria Street. In April last Mr. Merrin called upon him in response to an advertisement, and the defendant invited him to join in forming a limited company to purchase a large house at Lancaster Gate with the idea of converting it into flats. Mr. Merrin paid the defendant £500 as his share, and a company was registered with a capital of £100. Some hitch occurred in the negotiations with the house agents, and the defendant represented to Mr. Merrin that he had a bigger scheme on hand. He said he had a strong secret influence with Messrs. Vickers, and suggested that it would be a profitable idea if Mr. Merrin's firm was to amalgamate with Messrs. Vickers. After this the defendant borrowed from Mr. Merrin sums amounting to £140, of which only £50 had been repaid. He also obtained goods to the value of £300 from Mr. Merrin's firm, and had never paid for them. When asked in October last what had become of the £500 that Mr. Merrin first paid him, the defendant said he had deposited it in the National Bank, Old Broad Street, together with cheques for £1,000 each from Mr. Baring Gould and Sir Trevor Dawson, a director of Vickers, and that the money could only be withdrawn on their joint signatures. He gave Mr. Merrin what he said was his wife's cheque for £500, and asked him to hold it for a fortnight. When the cheque was presented it was returned marked 'Signature differs.'"

*The Times* states that at the previous hearing evidence was given that the defendant was adjudicated bankrupt at Hastings County Court in November, 1920. Mr. Merrin was called to give evidence in support of this statement, and the hearing was again adjourned.

# The Jubilee of Mr. Henry Alabaster.

On Friday last, at the Manchester Hotel, Aldersgate Street, the staff of the ELECTRICAL REVIEW entertained Mr. Henry Alabaster at dinner, to celebrate his completion of fifty years of association with the journal. The chair was occupied by Mr. E. S. Middleton.

## "Our Guest."

Following the toast of "H.M. the King," Mr. A. H. BRIDGE (Commercial Editor) proposed the toast of "Our Guest." He said it was just over a year ago when they met in that room to celebrate the jubilee of the ELECTRICAL REVIEW. That night they were privileged to celebrate a more interesting jubilee—a personal one—that of Mr. H. Alabaster, who had been for fifty years the head of the journal. It was impossible to refer to the subject of the toast without referring to the unique position which the "Trinity," as he might call it, occupied in relation to the electrical industry during those years when there were no associations representing the different sections excepting the Institution of Electrical Engineers. The "Trinity" he had in mind consisted of Mr. H. Alabaster, Mr. Tom E. Gatehouse, and Mr. H. R. Kempe, and he thought it was true to say that there had never been any other three men who had had the privilege of wielding such a power and such an influence in the electrical industry. If one examined into the influence of those three men, one found that it had been an influence for good all the way along. Going back to the early days of many of those present in connection with the ELECTRICAL REVIEW they saw what a small paper it was when they first joined it. That was the day of small things. Why was it that there was a beaten path to that building in Paternoster Row, along which came professors, students, manufacturers, and men who were considered the *élite* of the science at that time—why did they go to a place like that? The answer was: Because those three men were there, able to influence with a remarkable power the well-being of the electrical industry and the electrical profession. He could assure them that if that gathering had taken the form that some of them desired it should take, it would have been a very large one, because they would have had the *élite* of the electrical industry, the manufacturers and the traders, representatives of the Institution of Electrical Engineers—its past-Presidents, and men of science of great distinction who would have come with pleasure to add their meed of praise to their guest, because his influence was at the back of the trinity; in fact, his influence was at the foundation of the trinity. Mr. Alabaster's interest in the REVIEW began in 1874. There came along in due course after many difficulties had been surmounted, one whose loss they still deplored—Mr. Tom E. Gatehouse, whose influence still hovered about the ELECTRICAL REVIEW and whose traditions still influenced them in the work that they had to perform. Mr. Kempe was always happy and bright; always cheerful and contented. It was not his duty to refer so much to the past as to the present. The three men to whom he had referred were responsible for the power and the prestige of the ELECTRICAL REVIEW as it existed to-day. There were times of struggle, but to-day they were associated with a paper which gave stable and congenial employment to a large number of people. Many of the early associates of Mr. Alabaster had passed away into the mists, but they rejoiced in the presence of Mr. Alabaster himself in the heyday of his youth. Mr. Alabaster took an interest in the young sapling as he found it in 1874. He had since worked consistently to make the property a stable one. He had encouraged and developed it until to-day he had the satisfaction of knowing that its strong branches had spread throughout the whole electrical industry, and under those branches many of them had their nests in which they found congenial employment. Behind all great papers there was one strong man—any journalist would tell them that. Behind their paper they had had three strong men, Mr. Alabaster being the leader, in strength and stability and making for permanency all the way along. He would like to congratulate Mr. Alabaster on having completed fifty years of continuous part-ownership of the ELECTRICAL REVIEW, and in doing so he would like also to extend a hearty welcome to Mr. Alabaster's son, Mr. G. H. Alabaster, who had recently returned from the Far East; and to Mr. Ernest Gatehouse, son of Mr. T. E. Gatehouse, both of whom appeared that night for the first time in public, as managing directors with Mr. H. Alabaster. Under the arrangements which had been made for the future conduct of the business he felt sure that it would be possible to continue the high tone, character and traditions of the paper. Those of them who were familiar with the contents of the ELECTRICAL REVIEW would know that they had always been characterised by a high tone. The ELECTRICAL REVIEW was a paper that could never be "bought" and the three persons who constituted its trinity could never be "bought." It was because of their integrity and honesty of purpose that the paper stood as high as it did amongst newspapers and in the electrical industry. So far he had referred to the business qualities of their guest. Perhaps they would allow him to strike a higher note, and refer to the quality of human kindness which they had always experienced from the "Trinity" as he called it. Speaking of stability of character he was reminded of the steadiness that characterised the ELECTRICAL REVIEW all through the war period, when they felt that amid all the difficulties of those times they always had Mr. Alabaster on the ship and it was he more than any other who safely brought them through the difficulties of those days. They remembered Mr. Gatehouse and his technical qualifications and his great personality which had made his name honoured and respected throughout the world. He combined his powers with those of Mr. Alabaster in making the ELECTRICAL REVIEW what it was, backed up by Mr. Kempe and his other associates, some of whom were sitting not far from him that evening. In thinking of Mr. Alabaster it was the man they liked, apart from the purely business point of view. While they admired his business qualities, his thoughtfulness as an employer and his guidance as a counsellor, they remembered that there were other qualifications and virtues which at a time like that they esteemed more highly. He thought it was Whitcomb Riley who said:

"When a man aint got a cent,
And he's feeling kind o' blue,
An' the clouds hang dark and heavy
An' won't let the sunshine thro'
It's a great thing o' my brethren for a feller jus' to lay
His hand upon your shoulder in a friendly sort of way."

It was the kindliness of character, it was the sympathy, it was the personal charm, it was the interest which Mr. Alabaster had always taken in those who had been employed by him that they so greatly appreciated as human beings. It was a great thing that the drab parts of business might be shot through with brilliance by the sympathy and the support of the man who took an interest in their private affairs. As an employer, Mr. Alabaster had always been ready to help a lame dog over a stile, and that was one of the things which commended him to all of them. Mr. Alabaster had been interested in many matters with which the well-being of the staff was bound up. He had also taken an interest in benevolent funds and technical training funds connected with the electrical industry and with the printing and newspaper trades. He concluded by wishing on behalf of all present that Mr. Alabaster and Mrs. Alabaster might be spared for many years to enjoy a full measure of health and strength and that Mr. Alabaster would long remain overlooking the interests of the ELECTRICAL REVIEW.

Mr. W. H. WICKEN, in supporting the toast, said it gave him very great pleasure to say a few words on behalf of the Hosier Lane staff, and to bear testimony to the high esteem in which Mr. Alabaster had always been held by that department since its inauguration over forty years ago, several members present having been with them the major portion of that period. The working staff were always quick to recognise when they were in the employ of a fair and liberal-minded gentleman. The many generous acts of Mr. Alabaster would always be remembered—the week's holiday introduced many years before it was recognised as a trade custom, and the very generous manner in which he treated the men who volunteered for the great war, making an allowance to their depen-

dents and continuing to make those payments to the finish. The Hosier Lane staff hoped he would see many years of health and happiness in his semi-retirement.

The toast was drunk with great enthusiasm and accorded musical honours.

Before Mr. Alabaster responded to the toast, Mr. W. B. Warwick, on behalf of the staff, presented him with two interesting mementoes of the occasion. The gift to Mr. Alabaster took the form of a handsome silver cigar box and that to Mrs. Alabaster of a silver salver; both gifts were suitably inscribed. In making the presentations Mr. Warwick said he was sure he was voicing the sentiments of all present when he said that they were delighted to see Mr. Alabaster with them once again. He trusted he would never forget that evening but would long be spared to look back upon it with pleasure.

### Mr. Alabaster's Reply.

Mr. ALABASTER, on rising to reply, had a very warm reception. He said he had recently read in *The Times* a paragraph which was capable of a wider application than was there intended. It said, speaking of two things essential in politics—which two things, he considered, applied equally to all businesses:—"One is to have a clear and unmistakable aim, a very resolute purpose. The other is to pursue this aim with unfailing pertinacity—to use every change of circumstances, every turn of events, with the one object of moving forward by degrees to the ultimate aim. It is this persistence in method, this intelligent and far-sighted linking of detail with detail that in the end creates that impression of large and strong purpose which means prestige and getting things really and thoroughly done." Well, the aim of the ELECTRICAL REVIEW had always corresponded to these maxims. It had above all things aimed to be perfectly straight in all its dealings, both with its staff and with its clients, and always to give the best value possible in return for the support it received.

So much for its aims; and now for its persistence.

Away back in the early 'seventies, there was very little to write upon, and he had a very anxious time. He sat quite alone in a small room in No. 22, Paternoster Row, and then soon after he was able to add to his large staff of one, a draughtsman and an engraver. One addition after another was made, and the expansion went steadily on until, in the year 1881, his late lamented colleague, Mr. T. E. Gatehouse, on the advice of Mr. H. R. Kempe, joined him as Editor. The publishing was removed to the same address, and a little while after the REVIEW began employing its own composing staff at No. 29, Paternoster Row. Now, after fifty years of work and development, they had an editorial and publishing staff of 26; compositors engaged on the REVIEW only, 24; printers employed for the REVIEW weekly, over 100; outside writers and contributors, over 250. Altogether over 400 were employed in its weekly production.

Since 1882, when the publication became weekly, it had experienced one continuous course of development and expansion, and the success of the REVIEW had been, he thought, well won, and, he hoped, well merited.

The late Mr. P. D. Armour, the very successful American business man, said: "No general can fight his battles alone; he must depend upon his lieutenants, and his success depends upon his ability to select the right man for the right place."

Now, one very agreeable feature of his business connections had been the long and continuous service of so many of the staff: In the Editorial Department he found one—Mr. Bridge—had been engaged on the REVIEW for 33 years; Mr. Allen for 25 years. In the Advertisement Department—Mr. Middleton for 33 years; Mr. Haskell for 30 years; Mr. Bantin for 29 years; again, in the Publishing Office, he found Mr. Osborn had been there for 33 years; Mr. Stockley for 23 years; Mr. Hanger for 21 years. The travellers, Messrs. Pearston and Porter-Cox, had 31 and 17 years respectively to their credit, while in the Engraving Department Mr. Warwick had been with the REVIEW 37 years. Turning to the Composing Room, Mr. Wicken, their foreman, preceded in that position by his father, whose memory was always cherished with respect and affection, had had 32 years in the employ of the REVIEW, and his son, Mr. S. J. Wicken, apprenticed to the REVIEW originally, had already seen 11 years of work on its pages. Mr. Palmer, formerly apprenticed to the proprietors of the REVIEW, had 39 years to his credit; Mr. Scott 38 years; Mr. Plumley 34 years; Mr. Bave (another of the former apprentices) 31 years; Mr. Bonsier and Mr. May each 27 years; Mr. White, Mr. Ing, and Mr. Bell, each 26 years; and Mr. Sharman, 24 years.

These long periods of service were only exceeded by the longer connection of one whose name was known wherever electrical science was understood and appreciated—Mr. Harry Robert Kempe, who, away back in 1873, wrote in the earliest issues of the TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW, and who to this day retained his interest in the paper. In aiding the endeavours of the principals, the sympathy and faithful services of the staff had been of the greatest value, and he took that opportunity of gratefully expressing his high appreciation of those services.

Fifty years was a long period to look back upon, and when to that was added 27 years, at which age he was when he joined the REVIEW, they would see that he could not well expect the privilege of meeting them many times in the future.

The sons of two of the original firm were now its managing directors, the continuity of the business being he hoped to some extent safeguarded by the arrival last week of a son to Mr. Geoffrey Alabaster.

When Mr. Geoffrey Alabaster and Mr. Ernest Gatehouse should hold their twenty-fifth year celebration, he hoped they would be able to point to a similar continuous course of development and expansion, and that they might have had also the same harmonious support from the staff that their predecessors had always enjoyed. He thanked them for the beautiful and useful present they had made him, which would be handed on to his son as a permanent reminder, if such were ever needed, of the happy relations which existed between his staff and himself. On behalf of Mrs. Alabaster, who with the devotion of absolute unselfishness had several times nursed him back to life, he thanked them for the kindly thought of her, which would give Mrs. Alabaster the greatest pleasure.

## Parliamentary.

[By Our Own Parliamentary Correspondent.]

**Radio Telephony.**—On February 12th, Mr. HARTSHORN, the Postmaster-General, replying to a question by Captain Berkeley, said that the General Post Office was pursuing investigations into the commercial possibilities of radio telephony. A Technical Committee, consisting of representatives of various European administrations, had considered the question of European telephony, both wired and wireless, and was of the opinion that the use of radio telephony in the organisation of the European International system should not be resorted to, except in cases when connection by wire was impracticable. This opinion was no doubt based not only upon the limited number of wave bands at present available to meet other demands for radio communication, but also on the fact that radio telephony at present compared unfavourably with line telephony in the matter of reliability, secrecy, and cost. A committee, presided over by Admiral Sir Henry Jackson, was appointed by his predecessor last year to consider the possibility of Trans-Atlantic radio telephony for commercial uses, and that committee was now engaged in making the necessary investigations.

**Internal-combustion Engines.**—On February 12th, Mr. HARDIE asked the President of the Board of Trade whether, in view of the increased use of internal combustion engines, he would take measures for the production of fuel for such engines in this country.

Mr. SIDNEY WEBB replied that the Government was taking a leading part in the research which was taking place on this subject, and he would refer Mr. Hardie to the reports of the Fuel Research Board issued by the Department of Scientific and Industrial Research. Moreover, particular attention was being devoted, both by the Government and by private interests, to the carbonisation of coal at low temperature, but it would be premature to say that the technical and economic problems involved had been completely solved.

**Humber Tunnel.**—On February 12th, Lieutenant-Commander KENWORTHY asked the President of the Board of Trade whether he would consider the desirability of the construction of a road and railway tunnel under the estuary of the Humber with a view to relieving unemployment and improving communications.

Mr. HARRY GOSLING, who replied, said that no definite proposals for a tunnel under the Humber had at any time been presented to the Ministry of Transport. If the authorities concerned desired to submit such proposals they should receive careful consideration.

**Private Bills.**—On February 13th, the SPEAKER stated that the following private Bills, originating in the House of Lords, had been passed by the Examiners as complying with the standing orders:—The Chatham & District Light Railways Co. Bill, the County of London Electric Supply Co. Bill, the London Electricity Supply Bills (Nos. 1 and 2), the North Metropolitan Electric Power Supply Bill, and the West Thurrock Wharf and Railways Bill.

**Automatic Telephones.**—On February 14th, in reply to Mr. HOGGE, Mr. HARTSHORN said that a contract had been made with the Automatic Telephone Manufacturing Co., Ltd., but no monopoly had been granted it. On the contrary, three other companies were participating in the provision of automatic telephones in London, the patents owned by all four companies being pooled for this purpose. The value of the contract depended on the amount of plant ordered under it, which was not definitely settled, but would probably be in the neighbourhood of £1,500,000. The Automatic Telephone Manufacturing Co. was a British company, controlled by British directors, with its factory at Liverpool. It was known when the order was given that a considerable part of the capital of the company was held by the International Automatic Co., but as the plant supplied under the order would be, with negligible exceptions, if any, manufactured and installed by British labour, he saw no reason for any further inquiry.

# Business Notes.

**Bankruptcy Proceedings.**—JACOB SHAPERO, 627, Kingsland Road, London, N.—This matter was reported upon in our issue of January 11th, p. 54. The debtor carried on business at the above address as an electrical engineer under the style of the General Electrical Engineering Co., and also as a tailor in the name of Sharpe Bros. He attended before Mr. Registrar Mellor at the London Bankruptcy Court on the 12th inst. for public examination upon accounts showing liabilities £751 and assets valued at £556. The examination was concluded.

Appended is a list of the principal unsecured creditors:—

| | £ | | £ |
|---|---|---|---|
| M. Behr ... ... ... ... | 30 | W. Gold ... ... ... ... | 15 |
| Builder & Son ... ... ... | 50 | Maister-Cooper & Greveller ... | 85 |
| S. Brooks ... ... ... ... | 28 | Newstead & Sons ... ... ... | 52 |
| Condor Lamps, Ltd. ... ... | 51 | H. R. Payne & Co. ... ... | 42 |
| D. Hall & Co. ... ... ... | 27 | W. Pennell ... ... ... ... | 30 |
| Ell, Brockers & Co. ... ... | 35 | Royal Typewriting Co. ... ... | 15 |
| Harris & Woolf ... ... ... | 21 | S. Ryman & Co. ... ... ... | 70 |
| M. Goldwater & Co. ... ... | 78 | B. Rosenthal & Sons ... ... | 30 |

FREDERICK WILDE (carrying on business as the Liverpool Engineering Co.), 4, Marmaduke Street, Edgehill, Liverpool, electrical engineer.—Last day for receiving proofs for dividend, February 26th. Trustee: Mr. L. Nicholas, 19, Castle Street, Liverpool.

PERCIVAL BUTLER, trading as the Eastern Electrical Engineering Co., formerly 127, King Street, now No. 11, Row 116, both Great Yarmouth, electrical engineer.—The receiving order in this matter was made on debtor's petition. The statement of affairs showed liabilities of £156 and assets £2 17s. 9d. The first meeting of creditors was held on January 25th at the Official Receiver's office, 8, Upper King Street, Norwich. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Atlas Advertising Association ... | 14 | British Thomson-Houston Co., Ltd. ... ... ... ... | 28 |
| Charles Gates ... ... ... | 22 | | |
| Clarke, Hunt & Co. ... ... | 30 | | |

THOMAS SCOTT, trading with another as T. Scott & Co., 42, Handyside's Arcade, Percy Street, Newcastle-on-Tyne, wholesale electrical suppliers.—The application for discharge of this debtor was held on February 14th, at the County Court, Westgate Road, Newcastle-on-Tyne. It appeared that the receiving order was made on February 21st, 1923, and a dividend of 1s. 8½d. in the £ was paid. The Official Receiver said that debtor had traded after he was aware of his position, and asked that he should make an offer of £2 a month from his salary. Debtor declined to make any offer, and the case was adjourned so that he might have time to consider the matter.

G. E. HARRIS, plumber and electrical engineer, 14, North Street, Emsworth, Hants.—First meeting February 27th, at the Official Receiver's Office, 87, High Street, Portsmouth. Public examination, March 3rd, at the Court House, St. Thomas's Street, Portsmouth.

JOHN KAINE-FISH, wireless instrument maker, Sempolia, West Green Road, Tottenham, N.—Last day for receipt of proofs for dividend, March 1st. Trustee: Mr. T. Gourlay, 2, Russell Square, W.C.1.

NORMAN WILLIAMS, MABEL WILLIAMS, and WALTER COOK, trading as the British Radiophone Co., at Downing Street, Bulwell, Notts.—A surplus of £28 arising from the separate estate of Walter Cook is to be transferred to the credit of the joint estate. Trustee: Mr. L. H. West, O.R., 4, Castle Place, Nottingham.

M. O. HECKELS, electrical wholesaler and agent, 643, Welbeck Road, Walker, and Star Buildings, Northumberland Street, Newcastle-upon-Tyne.—Last day for receipt of proofs of dividend, February 28th. Trustee: Mr. W. Brittain, Pearl Buildings, 4, Northumberland Street, Newcastle-upon-Tyne.

T. CARTER, electrical engineer, 16, Durngate Street, Dorchester.—Second and final dividend of 5d. in the £, payable February 25th, at the offices of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C.

**Company Liquidations.**—BRIDGE & C.T.M. Co., LTD., wireless manufacturers, Fulwood House, Fulwood Place, London, W.C., and at Southend.—Pursuant to Section 188 of the Companies (Consolidation) Act, a meeting of the creditors in this matter was held on February 13th at the Connaught Rooms, W.C., when the chair was occupied by Mr. W. C. Green, of 11, Grove Crescent, Kingston-on-Thames, who stated that he had been appointed to act as the liquidator in the voluntary liquidation of the company. The statement of affairs presented disclosed liabilities of £594. The net assets were £187, or a deficiency of £405. The liquidator stated that he had received a claim for £200 from the managing director of the company, Mr. Bridge, in respect of undrawn salary and money paid in wages on behalf of the company, and goods bought on behalf of the company. The company was formed in February, 1921, with a capital of £5,000. The company was first known as C.T.M. Co., Ltd., but when wireless was introduced it changed its name to Bridge & C.T.M. Co., Ltd. The liquidator further stated that there was every possibility of selling the business as a going concern, and if it were sold privately the creditors would benefit by it. No resolutions were passed, and the voluntary liquidation of the company will therefore be continued, with Mr. Green as liquidator. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| K. Doherty ... ... ... | 66 | Smith & Sons ... ... ... | 20 |
| R. T. Hills ... ... ... | 40 | Siemens Bros. ... ... | 17 |
| British Broadcasting Co. ... | 69 | W. Martin ... ... ... | 17 |
| C. Peacock ... ... ... | 37 | N. Preedy ... ... ... | 13 |
| Hammond & Griffiths ... ... | 34 | Sugden Engraving Co. ... ... | 11 |
| G. Bozell ... ... ... | 25 | W. H. Taylor & Sons ... ... | 20 |
| S. G. Brown ... ... ... | 25 | | |

PRYCO, LTD., 14a, Shouldham Street, Edgware Road, London, W.—The statutory first meetings of the creditors and shareholders of this company, which carried on business as electrical engineers and dealers in electric lamps, were held on February 14th, at the Carey Street offices of the Board of Trade, Lincoln's Inn, W.C. Mr. J. B. Thompson, Official Receiver, reported that a compulsory winding-up order was made against the company on May 29th, 1923, upon the petition of Bell Battery & Accessories Company, 39, Wilson Street, E.C. The company was formed by Cleveland Jaeger and Oswald Bird for the purpose of acquiring and carrying on the business of electrical engineers and dealers in electric lamps, signs, &c., previously conducted by Ernest Arden Pye and E. B. Taylor, under the style of Pryce & Co. and Wright, Pryce & Co. The date of the company's formation was October, 1922, and it had a nominal capital of £2,000 divided into shares of £1 each. The issued capital amounted to £1,003, of which £1,000 was issued to the vendors as purchase consideration, and £3 subscribed in cash by the signatories. The business had been built up by Pye & Taylor, who began to trade under the style of Pryce & Co., in November, 1919, with a capital of £130. For the first nine months they drew no profits, and, having good agencies in view, they decided to obtain further capital, and were introduced by Jaeger to Bird. At the time of the formation of the company there was a surplus in assets of £1,500. Jaeger had stated that he had known Pye & Taylor for some years. Pye came to him with a patent flasher and electrical device for advertising, the heat of the lamp breaking and making the contact, for which patent he had obtained the sole selling agency in this country. But four months after the incorporation of the company it was ascertained that the flasher was defective, and did not function properly. It gave satisfactory results at first, but subsequently it was found impossible to manufacture it so that it would act properly for a reasonably lengthy period, with the result that large numbers of flashers were returned by purchasers. These were at first replaced, but it eventually came to a point when the directors were compelled to realise that the company could not supply a dependable article. But for that fact the company would have been a distinct success. The purchase by the company consisted of the vendors' wholesale and retail business at Shouldham Street, carried on under the style of Pryce & Co.; also at 155, Hammersmith Road, 1, Harrow Road Market, and 37, Old Town, Clapham. The agencies held by the company were in respect of a patent flashing adapter, switch lampholders, Swedish electric lamps, and electric window signs, but these were lost in consequence of the company's not taking up stock or making the requisite payments in connection with it. The company had also held a half share in two patents in respect of an adjustable flashing adapter and a time switch. On October 24th, 1922, a debenture for £700, carrying interest at the rate of 10 per cent. per annum, was issued, and on April 5th last Mr. L. W. Stanley was appointed receiver on behalf of its holder. An action had been brought by a creditor asking that he should receive priority over the debenture holder, and consequently the receiver had not been able to distribute the assets, but there was no chance of anything coming to the unsecured creditors or to the shareholders. According to the company's statement of affairs, the assets were worth £553, while the claims of the unsecured creditors were returned at £2,806. There was also a fully secured liability of £802, the debenture holder's claim of £746, and preferential claims amounting to £130. The total deficiency with regard to the shareholders was returned at £4,046. The insolvency of the company was attributed by Messrs. Pye and Taylor to the failure of the promoters to introduce working capital, and to the issue of the debenture bond, which prevented the company from obtaining credit. Messrs. Jaeger and Bird attributed it to the company's inability to supply a dependable article, owing to which their efforts to obtain capital failed, and in the opinion of the Official Receiver the collapse was due to lack of working capital and mismanagement.

No resolution was passed at either meeting, and the chairman announced that the liquidation would remain in the department of the Official Receiver.

MAGNETIC SIGNS & CARRIERS, LTD.—Winding up voluntarily. Liquidator, Mr. J. C. Sherrott, Finsbury Pavement House, E.C.2.

HOLBORN RADIO CO., LTD., 267, High Holborn, W.C.—Meetings of creditors and contributories were held on February 21st at 33, Carey Street, W.C.2.

LEITNER ELECTRICAL CO., LTD., Maybury, Woking.—Liquidator, Mr. H. E. Burgess, Senior Official Receiver, 33, Carey Street, W.C.2, released February 7th.

A. C. ALEXANDRA & Co., LTD.—First meetings of creditors and contributories on February 26th, at Carey Street, W.C.2.

**Dissolutions of Partnership.**—SHEFFIELD RADIO ELECTRIC Co., 60, Bailey Street, Sheffield, electrical engineers and manufacturers of electrical and radio-telephony apparatus.—Messrs. E. Brooks, H. W. Roberts, and G. W. Bagshaw have dissolved partnership. Mr. E. Brooks will attend to debts.

PENTY & MARGETTS, electrical engineers and contractors, Hustlergate, Bradford.—Messrs. P. W. Penty and R. Margetts have dissolved partnership. Mr. Margetts will continue the business on his own account and attend to debts.

**Trade Announcements.**—MR. GEO. MORRISON has opened a branch showroom at 28, Guildhall Street, Preston, where he wishes to receive catalogues of electrical and wireless accessories.

MR. W. A. MCKERCHAR, late manager of the Albion Electric Stores, has commenced business as an electrical engineer and contractor at 20, Central Road, Leeds. He desires to receive price lists, &c., from electrical manufacturers and factors.

MESSRS. W. T. GLOVER & Co., LTD., of Trafford Park, are now keeping a stock of v.i.r. wires, cables, and flexible cords at 2, Glebe Buildings, Stoke-on-Trent.

**For Sale.**—By order of the liquidator of Enamelled Wires, Ltd., Messrs. G. N. Dixon & Co., Ltd., will sell by auction on February 29th, at 51, Fairclough Lane, Liverpool, enamelled wire plant, motors, machinery, reels of wire, &c. Messrs. Joseph Hibbard & Sons will sell by auction on February 26th an electrical engineer's stock and plant, including motors, machine tools, &c. (See our advertisement pages to-day.)

**Deed of Assignment.**—G. E. MANDER and G. L. TOWNSEND (trading in co-partnership as the Bingley Electrical Co.), Park Road, Bingley.—Claims to be sent to the trustee, Mr. C. H. Baker, 1, Albion Street, Leeds, by March 7th.

**Book Notices.**—Publications of the United States Bureau of Standards. Circular No. 150, "Recommended Specification for Quicklime and Hydrated Lime for use in the Manufacture of Sand-Lime Brick" (5 cents); Circular No. 153, "Recommended Specification for Quicklime and Hydrated Lime for the Manufacture of Silica Brick" (5 cents); Technologic Papers No. 244, "A Measure of the Color Characteristics of White Papers" (5 cents); No. 245, "Embrittlement of Malleable Cast Iron resulting from Heat Treatment" (5 cents); and No. 246, "Wet-Process Enamels for Cast Iron" (10 cents). Circular No. 56, "Standards for Electric Service" (60 cents); Scientific Paper No. 477, "Spectro-radiometric Analysis of Radio Signals" (10 cents); Technologic Papers No. 241, "A Comparison of the Deoxidation Effects of Titanium and Silicon on the Properties of Rail Steel" (10 cents); and No. 243, "Stresses in a few Welded and Riveted Tanks tested under Hydrostatic Pressure" (10 cents). Also two pamphlets on the elimination of waste in asphalt and woven-wire fencing. Washington: Government Printing Office.

"Fitting and Adjusting Bearings," by Capt. R. Twelvetrees, A.M.I.Mech.E. Pp. 60; figs. 29. "Practical Hand Forging," by Capt. R. Twelvetrees. Pp. 64; figs. 40. "Marking Out for Machinists," by Capt. R. Twelvetrees. Pp. 69; figs. 34. London: Percival Marshall & Co. Price 9d. net each.

British Electrical and Allied Industries Research Association.—Third annual report (Ref. E.R.A./T77) for the year ending September 30th, 1923. Pp. 48; one diagram. London: The Association.

**Catalogues and Lists.**—HARWOL SPECIALTIES Co., 11, Strand Street, Liverpool.—A blotter advertising a self-adjusting ring spanner for hexagon nuts.

MESSRS. C. H. PARSONS, LTD., Britannia Works, Tyseley, Birmingham.—A price list of "Britmac" switches and lampholders.

MESSRS. MICHELL BEARINGS, LTD., South Benwell, Newcastle-on-Tyne.—A well-illustrated catalogue of thrust blocks, journal bearings, &c., of various designs.

WESTINGHOUSE ELECTRIC AND MANUFACTURING Co., East Pittsburgh, Pa., U.S.A.—Publications advertising a 1½-kW turbo-generator; insulating compounds; and domestic heating, cooking, and labour-saving appliances.

THE SUN ELECTRICAL Co., LTD., 118 and 120, Charing Cross Road, W.C.2.—An illustrated and priced catalogue of "Sterling" radio amplifiers and loud speakers, and a series of pamphlets dealing with "B.T.H." sets and accessories, and those of other leading manufacturers. List No. 402, an illustrated catalogue of radio receiving sets, accessories, and parts. Also a pamphlet advertising the "J.A.B." and "Brook" electric lamp locks.

THE HURST ELECTRICAL PLANT, LTD., Belfast.—An illustrated leaflet bearing a description of a three-phase gearless drill.

MESSRS. POPE'S ELECTRIC LAMP Co., LTD., Elasta House, 5, Arthur Street, New Oxford Street, W.C.2.—An illustrated price list of "Elasta" vacuum and gasfilled lamps of many patterns.

MESSRS. BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—An illustrated leaflet advertising the "Armstrong" electric table stove.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—February stock list of motors and dynamos.

MESSRS. E. P. ALLAM & Co., 107-109, Gray's Inn Road, W.C.1.—February list of d.c. motors in stock.

THE VICKERS-SPEARING BOILER Co., LTD., 20, Kingsway, W.C.2.—A well-illustrated brochure on water-tube boilers.

**German Import Regulations.**—According to a list published in the Board of Trade *Journal*, the following are amongst the articles added to the list of goods exempt from licence requirements on importation into unoccupied Germany:—Steam boilers and drums of malleable iron and assembled parts thereof, and boiler fittings; accumulators and electrodes; complete cases for arc lamps, mercury vapour lamps, quartz lamps, and similar lamps combined with glass globes; searchlights; reflectors; electric incandescent lamps; electric signalling and safety apparatus; electric bells and parts; galvanic and dry batteries and elements; thermo-electric couples and parts; insulating tubes, globes, buttons, spools and similar mountings for insulation of stoneware, china, or glass, not combined with other materials, and not imported as parts of knocked-down electro-technical plant; and insulating articles of asbestos, asbestos board, mica, and micanite for electro-technical purposes, except insulating tubes.

**Italian Public Works Exhibition.**—A municipal public works exhibition is to be held in May and June next at Vercelli. It will embrace water, electricity, gas, tramways, refrigeration, milling, pharmacy, telephones, &c. It will be the first of its kind to be held in Italy.

**Monetary Policy and Trade Improvement.**—The Federation of British Industries have addressed the following letter to the Prime Minister drawing attention to the possible check to the improvement in trade that may result if the country remains committed to its present monetary policy:—

"The F.B.I. feel that they need not recapitulate in full the arguments and reasons for a serious re-consideration of the policy recommended by the Cunliffe Committee, as they expressed them at some length in a memorandum addressed to Mr. Baldwin as recently as October 23rd, 1923.

"The Federation are, and have always been, opposed to any policy of 'inflation' on the ground that it would introduce an element of instability into industrial conditions. At the same time, they feel that a continued policy of 'deflation' may, under present circumstances, be equally injurious to that 'stability' upon which all hopes of an industrial revival depend. They welcomed, therefore, Mr. Baldwin's announcement that a policy of active 'deflation' had been temporarily abandoned, and attribute to that announcement and to the action which preceded and followed it much of the improvement in trade conditions of which the first symptoms were visible in the last few months.

"They cannot, however, ignore the fact that as matters stand a policy of active 'deflation' may at any moment be resumed by reducing the amount of Treasury Bills in the hands of the banks, and that if Treasury action in this direction were to prevent the banks from obtaining the additional cash resources required by an expansion of production, credits must be restricted and the trade revival checked, all the more rapidly since the latest figures appear to indicate that the advances made by the principal banks are nearing the maximum proportion to deposits permitted by sound banking practice. Their apprehensions in this respect are intensified by the retention in force of the Treasury Minute of December 15th, 1919, restricting the note issue, which unless withdrawn will ensure that the margin available for currency expansion during the present year is so small as to be insufficient to support any substantial further increase of trade or employment.

"The Federation feel that, as manufacturers, they may well be so preoccupied by the industrial aspect of this problem as to fail to give due weight to more purely financial considerations. They hesitate, therefore, to do more than press for renewed and careful consideration. They desire, however, to quote in corroboration of the arguments which they have urged upon His Majesty's Government for the past three years, the words of the chairman of the Midland Bank who, speaking with the double authority of the head of a great financial organisation and of an ex-Chancellor of the Exchequer, said: 'No trade can stand up against a continued decline in the purchasing power of the public. Less money means lower prices or less production, or both, and orders will be withheld so long as there is an expectation that prices will fall. We have deliberately to make up our minds as to what we want. If we mean to get rid of unemployment we must have more money in existence to take up the increased production; if we mean to reduce our present amount of money we shall not escape continued unemployment'; and 'when national output is below productive capacity, the policy should be to let money out; when production is at a maximum, the outflow of money should be checked and, if inflationary symptoms have appeared, money should be withdrawn.'"

**Unemployment.**—The number of persons on February 4th, 1924, recorded on the live registers of the Employment Exchanges in Great Britain was 1,209,700. This was 75,916 less than on January 28th, 1924, and 276,178 less than on January 1st, 1923. In addition, the number working systematic short-time and drawing benefit for intervals of unemployment was 51,000 on February 4th, 1924, as compared with 52,147 on January 28th, 1924, and 56,261 on January 1st, 1923.—*The Times*.

**Peru's Foreign Trade.**—During 1922 Peru imported electrical machinery and appliances to the value of £P157,560; motors, boilers, turbines, and pumps were valued at £P77,961, and scientific instruments at £P14,114.

**Recent Contracts.**—THE GENERAL ELECTRIC CO., LTD., has secured a contract for the supply of electric lamps for the Great Southern and Western Railway Co., Ireland, for a period of five months, commencing with February 1st.

MESSRS. JOHNSON & PHILLIPS, LTD., Charlton, S.E.7, have received from the Southern Railway a contract for the supply and installation of the whole of the high-pressure feeder cables for the electrification of the S.E. & C.R. suburban lines. The contract comprises some 125 miles of three-core cable, and is the largest yet placed in connection with British railway electrification.

MESSRS. SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., have received an order from the Admiralty for a large quantity of Siemens helical traction lamps.

*The Times* reports that the ENGLISH ELECTRIC CO., LTD., has received from the Tata Power Co., Bombay, an order for five water turbines and generators for an aggregate of 150,000 h.p., in connection with the Nila Mura hydro-electric scheme. This will be the third of the Tata companies' large stations, the others being at Khopoli, where there are six 15,000-h.p. sets, and at Andhra Valley, with five similar sets. Current is transmitted at 100,000 V to Bombay, where it is stepped down for industrial use.

**German Insulating Tube Trade.**—Some of the smaller firms belonging to the Community of Interests of German Insulating Tube Works, of Berlin, recently gave notice of intention to withdraw from this syndicate. The question was brought before the Syndicate Court which has been set up under the new syndicate law, and the court has decided that the notices are inadmissible because the alteration in the economic situation, also according to the new law, does not represent an important reason for the determination of the syndicate.

**Lead.**—In their report, dated February 16th, Messrs. James Forster & Co. stated:—"Imports for January were very heavy and much above the average of the past year, large as it was. In spite of this there is no surplus lead about. Consumers have no doubt filled themselves up for the time being in view of the possibility of the dockers' strike. However, in the absence of any prospect of shipments from Mexico in the next two or three months, we seem bound to have a difficult time, that country being such an important contributor to the world supply of lead. Consumption continues on a large scale, and with every prospect of its being fully maintained in the future. In America the position is as strong as ever, and doubtless when Mexican supplies are available she will be a strong competitor for same. The Board of Trade returns for January are:—Imports, 21,805 tons; exports, 2,468 tons; leaving for home consumption 19,337 tons."

**Lamp Manufacture in Poland.**—A Polish-Dutch undertaking has recently established large works in Warsaw for the manufacture of the Philips type of incandescent electric lamps. The works are being run under the control of Dutch lamp specialists.

**British Trade-Mark Applications.**—The following are among the recent applications for British trade marks. Objections may be entered against any of the proposed marks within one month from the dates mentioned. In the case of foreign applications, the names and addresses of the British representatives are also given:—

Pelmerset. No. 443,678. Class 8.—Apparatus for use in wireless telegraphy and telephony. Peronet, Ltd., 38, Bloomsbury Square, London, W.C.1. February 13th, 1924.

Tregolac. No. 443,779. Class 8.—Electric cables. Ward and Goldstone, Ltd., Pendleton, Manchester. February 13th, 1924.

W. (lettering and design). No. 443,961. All goods in Class 8. No. 443,962. All goods in Class 11.—Watson & Sons (Electro-Medical), Ltd., Sunic House, 43, Parker Street, Kingsway, London, W.C.2. February 13th, 1924.

Bretwood. No. 444,289. Class 8.—Apparatus for use in wireless telegraphy and telephony. Radio Improvements, Ltd., 95 Great Portland Street, London, W.C. February 13th/24th.

Volta (lettering and design). No. 435,175. Class 8.—Connectors, wall plugs, circuit switches, &c. Nya Elektriska Aktiebolget Volta, Johannesfredsvagen, Kvarteret Magneten, 4 & 5, Ulfsunda, Stockholm, Sweden. (Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.) February 13th, 1924.

Bordac. No. 443,300. Class 13.—Switches, terminals, and contacts, conduit fittings, cable sockets, adaptors, lamp holders, &c. The Bordesley Electrical Accessories Co., Ltd., 162, High Street, Bordesley, Birmingham. February 13th, 1924.

**Working Hours in Switzerland.**—A *Reuter* telegram from Berne states that the result of the referendum on the extension of the working week in factories to 54 hours was 433,000 votes against and 315,000 for. The proposal was therefore rejected. Seventy-seven per cent. of those eligible recorded their votes.

**E.W.F. Luncheon.**—The annual luncheon of the Electrical Wholesalers' Federation was held at the Hotel Russell on Wednesday last. A report of the proceedings will appear in our next issue.

**Electricians' Wages.**—In accordance with the agreed recommendation of the National Conference of the National Federated Electrical Association and the Electrical Trades Union at Manchester on February 7th, 1924, the rates of all grades will be increased by reverting to the reduction of 27 per cent. on the April, 1921, rates, to come into effect on the first pay day following Sunday, March 2nd, 1924, for the period covered by that pay day. The revised rates under the National Wages Agreement for the Electrical Contracting Industry will be as follows:—Grade A, 1s. 10d. This rate includes a travelling allowance, no further allowances to be paid except as provided by Rule 9 of the London Rules dated February, 1920; Grade B, 1s. 7½d.; Grade C, 1s. 6½d.; Grade D, 1s. 4½d. These rates will remain current up to and including December 31st, 1924.

**New Indian Tariffs.**—It is understood, says the *Financial Times*, that the report of the new Indian Tariff Board will recommend a slight increase in the existing revenue duty of 10 per cent. on manufactured steel, with a further proposal to encourage the industry by a bonus on production or sales. No preference is to be extended to British imports.

**Argentine Tariff Charges.**—Among recent additions made by the Argentine Government to the import free list are the following:—"Machinery in general" (*i.e.*, not otherwise specified); repair parts for same, including washing and sewing machines; and "Machinery for the installation of gas and electricity."

**War Office Stores: Standardisation.**—At the invitation of the War Office, the Federation of British Industries has nominated Mr. W. Prescott, head of the Production Department, to serve on an inter-Departmental Committee on General Stores. The F.B.I. *Bulletin* states that the terms of reference of the committee are:—

(i) The adoption, wherever possible, of trade standards and patterns for commodities and stores common to and in use by the three Services.

(ii) The standardisation, wherever practicable, of the specification and design of commodities and stores common to and in use by the three Services for which a trade pattern is unsuitable.

(iii) The co-ordination of the methods and procedure of inspection.

**The Lyons Fair.**—The Lyons Fair, which is to be held from March 3rd to 16th, will be on a somewhat larger scale than last year; there will be eight new halls, making a total of twenty, accommodating 1,700 stands. The number of exhibitors at the Fair (2,500) will be unusually large. As an introduction to the fair itself, an International Congress for the Expansion of Foreign Relations will be held at Lyons from March 1st to 4th. The programme of the Congress will include the study of questions connected with the circulation of capital, the commercial *régime* applicable to colonies, trade with countries where the rates of exchange are high, &c. Great Britain, Switzerland, Holland, Italy, Czecho-Slovakia and Austria will be represented. Metallurgy, machinery, electrical and heating apparatus will be particularly well represented.—*Reuter's Trade Service* (Paris).

**British Empire Exhibition Note.**—The St. Marylebone Borough Council informed the British Electrical Development Association in July last that it regretted that it could not make a contribution towards the Association's exhibit at the Wembley Exhibition. The Electric Supply Committee now recommends that, notwithstanding this decision, the sum of £300 be contributed, being half the sum, calculated on the generating capacity basis, suggested by the Association.

**Local Exhibitions.**—WARRINGTON.—An Industrial Trades and Domestic Economy Exhibition, in which electrical appliances were prominently displayed, was held recently. The Corporation Electricity Department had one of the most attractive stands, on which was shown what one kWh of electricity will do: sustain an ordinary lamp for 33 hours; a night light for 200 hours; boil a kettle of water ten times; toast 40 slices of bread; heat a hair curler 60 times, &c. Wash boilers, fires and cookers were shown. Adjoining was a comprehensive range of electrical exhibits by Messrs. H. Bibby & Co., comprising many useful domestic appliances. This firm was the wiring contractor to the exhibition. The Economic Electric Co. concentrated attention upon wireless apparatus.

TUNBRIDGE WELLS.—At the Ideal Home Exhibition, held at the Pump Room and Sussex Assembly Room, recently, an excellent display of electrical appliances for home and business were on view, particularly labour savers for the home. Demonstrations of electric cooking were also given continuously throughout the period of the exhibition. Two lectures, illustrated with lantern slides, and dealing with "Electricity—the Home Labour Saver," and "Electricity in the Home," were delivered by Mr. Victor W. Dale, of the British Electrical Development Association.

PRESTON.—In connection with the improved supply of electricity, which will be available from the new Ribble power station in June, arrangements are being made for an electrical exhibition to be held in the second week in March. Seventeen electrical firms are co-operating.

GREENOCK.—An exhibition of electrical appliances under the auspices of the Corporation Electricity Department was opened in the Town Hall on February 12th. Daily lectures and demonstrations were given, and the attendance was good.

**Hungary's Foreign Trade.**—According to a *Commerce Reports* statement, during 1922 Hungary imported 1,092 metric tons of electrical goods, and during the same year exported 3,514 metric tons. The figures for 1921 were 1,435 and 2,384 metric tons respectively.

**Japan's Machinery Trade.**—The imports of machinery and parts into Japan during 1922 amounted to 114,371,035 yen, to which Great Britain contributed to the extent of 42,203,499 yen, the contribution of the United States being 57,310,794 yen. These figures compare with 119,882,164 yen, 43,983,356 yen, and 63,612,378 yen respectively in 1921. The exports of machinery totalled 14,425,104 yen, as against 12,883,101 yen in 1921. The bulk of this went to China and Kwangtung Province. In the first half of 1923 Japan imported machinery to the extent of 64,031,761 yen (Great Britain, 25,409,694 yen; United States, 26,209,312 yen). Machinery exports during this period amounted in value to 4,400,917 yen.

**Electrical Sales in the United States.**—The February issue of *Electrical Merchandising* contains tabulated estimates of authorities in the market for electrical supplies of the sales during 1923. The figures take no account of sales of plant, &c., to central station owners, they apply only to the general public. It is estimated that the grand total of sales of electrical appliances, wiring supplies, radio equipment, &c., amounted to $2,003,745,000. It is of interest to note that the estimated revenue from the sale of electricity during the year was $1,300,000.

**Correction.**—Our Advertisement Department wishes to express its regret that a mistake has been made in certain issues in the advertisements of Messrs. Sandycroft, Ltd. Their cascade motors have been described as "Manufactured under Sandycroft-Hunt-Crossley Patents." This is, of course, wrong; Mr. F. Creedy, A.M.I.E.E., A.C.G.I., Assoc.Amer. I.E.E., the well-known electrical and mechanical engineer, is the co-patentee, and the correct description is "Sandycroft-Hunt-Creedy Patents."

**Calendar.**—MR. CECIL RIDLEY, 35 & 37, Dundas Mews, Middlesbrough, has sent us a wall calendar with monthly slips.

## Lighting and Power Notes.

**Atherton.**—ELECTRICITY EXTENSIONS.—The Electricity Commissioners have agreed to the extension by the South Lancashire Tramways Co. of its generating station plant in order to meet the increased demand for electricity.

**Arabia.**—ADEN.—The Port Trust is undertaking the construction of a generating station at a cost of 600,000 rupees, says *Commerce Reports*. It is planned to commence work during this year, and it is expected that the streets of Aden will be well lighted and the houses equipped with lights and fans by 1926.

**Barnes.**—The Urban District Council has decided to appoint Mr. J. S. Highfield as consulting engineer, to report on schemes submitted by the Council's electrical engineer, Mr. C. S. Davidson, for the improvement of the system of electrical distribution in its area.

**Barnsley.**—SPECIAL ORDERS.—The Town Council is applying to the Electricity Commissioners for Special Orders for powers to distribute electricity to the whole of the county borough as extended in 1921, and to revoke Orders granted previously to local authorities whose areas are now included in that borough.

**Birkenhead.**—ELECTRICITY SUPPLY.—The Corporation is applying to Wallasey Corporation for terms and conditions for an additional electricity supply to Birkenhead.

**Bridlington.**—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (electrical engineer: Mr. A. J. Beckett) for the year ended March 31st, 1923, show a total income of £22,705, as compared with £22,222 in 1921-22. Working expenses amounted to £8,427 (£12,140), leaving a gross profit of £14,278 (£10,082). After payment of interest, sinking fund charges, &c., there was a net profit of £9,107, as against £5,311 in the previous year. Capital expenditure during the year amounted to £2,276, the chief item being £1,458 for mains. The amount of electrical energy sold was 691,056 kWh, an increase of 29,479 kWh.

**Bradford.**—NEW SUB-STATION.—The Finance Committee has approved, subject to borrowing powers being obtained, and to the receipt of a grant (if possible) from the Unemployment Grants Committee, the Electricity Committee's proposal for the erection and equipment of a sub-station, for general and traction purposes, at Four Lane Ends, at an estimated cost of £17,018, including land and buildings (£2,620), converting plant (£5,150), switchgear (£1,210), two transformers (£640), and cables (£7,398).

**Belgian Congo.**—NEW POWER STATION.—Work is in hand on the erection of a generating station in connection with the coal pits of the Société des Charbonnages de la Luena, to supply current for the operation of the winding engines and other mining plant.

**Brighton.**—SPECIAL ORDER.—The Corporation has applied to the Electricity Commissioners for a Special Order authorising it to extend its area of electricity supply so as to include the urban district of Portslade-by-Sea.

**Canterbury.**—LOANS.—The Town Council has applied to the Electricity Commissioners for sanction to a loan of £3,000 for the installation of a 500-kW motor converter. Sanction has been received to a loan of £3,092 for feeder cables.

**Continental.**—ITALY.—*Commerce Reports*, quoting from an authoritative source, says that in 1915 the power generated by the hydro-electric central stations amounted to 1,520,000 h.p.; in 1922 the figure was 2,170,000 h.p.—an increase of 55 per cent. The increase during 1921-22 amounted to 300,000 h.p. Important works will be undertaken shortly in the Trentino, Venezia, which in three or four years will bring the power harnessed to industry up to 3,000,000 h.p.

FRANCE.—La Société des Mines de Lens is steadily re-establishing its collieries at Lens following the damage caused during the war. The generating station at Pont-a-Vendin, which supplies current for the operation of the various mining plant, has now a capacity of 30,000 kW. A fifth generating set of 10,000 kW capacity has recently been completed, and a sixth set of similar capacity is also in course of installation.

The Vieille-Montagne Mining Co. has recently secured a concession from the French Ministry of Public Works for the erection of a transmission line between the hydro-electric power station on the River Viaux at Thuries and the company's metallurgical works at Viviez (Aveyron). As the whole of the plant at these works is to be electrically operated, a second hydro-electric generating station is to be established on the River Viaux at La Laurelie to supply the necessary current.

BELGIUM.—La Société d'Electricité de l'Escaut, of Antwerp, during its last financial year entered into an agreement with the authorities of the East Flanders province for the supply of electricity to thirteen communes on the left bank of the River Scheldt. In the province of Antwerp the company has secured concessions to supply current to three communes and for the erection of a central distributing station at Beersse, whence the town of Turnhout and several communes in the eastern part of the province will be supplied. The demand for electricity is increasing, and a further extension of the plant at its generating station has been decided upon.

SPAIN.—A transmission line 62¼ miles in length has recently been completed by the Compania Mengemor, between Cordoba and Villanueva de las Minas (Province of Seville). The line, which transmits energy at a pressure of 70,000 V, is carried on armoured concrete columns 46 ft. high.

**Cornforth.**—STREET LIGHTING.—The local Council is considering the question of lighting the streets of West and Old Cornforth by electricity.

**Edinburgh and Lothians Electricity District.**—LOCAL INQUIRY.—The Electricity Commissioners have issued a draft Order constituting the above-named district, with respect to which they are to hold a local inquiry in the City Chambers, Edinburgh, on March 10th, 1924, at 10.30 a.m., and in order finally to determine the area of the proposed district.

**Fareham.**—ELECTRICITY AGREEMENT.—The Urban District Council has submitted a draft agreement with the Portsmouth Town Council for a supply of electricity in bulk to the Electricity Commissioners. The proposed terms are £5 per kVA, plus .7d. per kWh, with a reduction of the kVA charge to £4 10s. should the electrical energy taken exceed 500,000 kWh per annum, the price per kWh to be subject to an increase or decrease of .015d. per kWh for every 1s. per ton rise or fall in the price of coal on a basic price of 32s. per ton.

**Fordingbridge.**—SPECIAL ORDER.—The Rural District Council has decided to give its consent to the application of Mr. J. G. Royce for a Special Order to supply electricity in the district.

**Keighley.**—LOANS.—Application is being made by the Corporation for sanction to borrow £5,000 for the purpose of the construction of a new transmission line from the electricity works to Bingley, partly underground and partly overhead, the erection of a new switch house at Marley, and the provision of a new control panel. Sanction has recently been received for the borrowing of £3,667 for electricity sub-station equipment repayable in 19 years.

**London.**—HACKNEY.—The Finance Committee has approved of a proposal submitted by the Electricity Committee that the public lighting be converted from gas to electricity. The estimated cost is £177,118, made up as follows:—Distributing mains, £145,000; lamp services, £18,768; lamp-post equipment, £13,350. The Finance Committee has recommended that application be made to the Electricity Commissioners and the London County Council for sanction to the borrowing of the sums for the purposes mentioned.

FULHAM.—The Borough Council has received the sanction of the Electricity Commissioners to the extension of the power station at Townmead Road. Two 6,000-kW, 3-phase, 50-cycle, turbo-alternators and three 40,000-lb. boilers are to be installed.

**Leighton Buzzard.**—ELECTRICITY SUPPLY.—At a recent meeting of the Urban District Council it was reported that Aylesbury Town Council had withdrawn its proposals to supply electricity, as Luton Town Council was prepared to give a supply at a much lower rate. The charges proposed by Luton Corporation are 33⅓ per cent. above those paid by Luton consumers.

**Luton.**—OPPOSITION TO BILL.—The Town Council has decided to oppose the Bill of the North Metropolitan Electric Power Supply Co., Ltd., which seeks to extend the area of

supply so as to include, among other places, Baldock, Hitchin, and Stevenage. The Council's scheme provides for the inclusion of these districts in the borough's extended area of supply.

**Maldon.**—OPPOSITION TO BILL.—The Town Council has decided to oppose the Bill of the County of London Electric Supply Co., Ltd. The Council takes exception to the use of overhead lines and to the maximum prices of 1s. per kWh for electricity for lighting and 4d. per kWh for power.

**Malvern.**—ELECTRICITY SUPPLY.—The Urban District Council has received sanction to loans of £1,436 and £734 for electricity purposes. The Electricity Commissioners have granted the Council a Special Order for the supply of electricity to Madresfield Court, Pickersleigh Court, and St. Agnes Home, the properties of Lord Beauchamp, which are outside the area of supply under the Council's Order.

**Machynlleth.**—PROPOSED ELECTRICITY SUPPLY.—The Urban District Council has extended an invitation to the North Wales Power Co. to confer with the Council with a view to supplying the area with electricity.

**Newport Pagnell.**—ELECTRICITY ORDER.—The Urban District Council has consented to the application of the Northampton Electric Light and Power Co., Ltd., for an Order to supply electricity within the Council's area.

**Newport (Fife).**—SPECIAL ORDER.—At a recent meeting of the Town Council a letter was read from Messrs. Balfour, Beattie & Co., Ltd., of Edinburgh, on behalf of the Fife Tramways, Light and Power Co., Ltd., intimating that the company proposes to apply to the Electricity Commissioners for a Special Order, which would include the burgh of Newport. The Council remitted the letter to the Finance Committee for consideration.

**Norton.**—ELECTRICITY SUPPLY.—Reporting on the provision of mains in the Norton rural district, the general manager of the Sheffield Corporation Electricity Supply Department states that the estimated cost is £20,000. The scheme will provide for all immediate requirements of the district and for subsequent extensions to any part of the area where a supply is needed.

**Price Reductions.**—Reductions in the charges for electricity have been made or recommended in the following districts:—

BANGOR.—Lighting: First 500 kWh per quarter, from 9d. to 8d. per kWh.

NEWCASTLE-UNDER-LYNE.—Lighting: From 8½d. to 8d. per kWh. Power: From 3½d. to 3¼d. per kWh. With discounts according to quantity consumed.

WOLVERHAMPTON.—Electricity for all purposes from 60 per cent. to 50 per cent. above the pre-war rate.

**Shrewsbury.**—HOSPITAL LIGHTING.—The Salop County Council has decided to replace the present gas-lighting system at the County Mental Hospital by an electrical installation at a cost of £7,850.

**Sunderland.**—LOANS SANCTIONED.—The Electricity Commissioners have sanctioned the borrowing by the Corporation of £32,500 for mains, and £80,000 for new plant.

**Tring.**—PROPOSED ELECTRICITY SUPPLY.—The Urban District Council is to take a canvass of residents with a view to ascertaining the number who would be willing to take an electrical supply. It is proposed to obtain a supply of electricity from Aylesbury.

**Torquay.**—ELECTRICITY IN BULK.—The Town Council is negotiating with the Teignmouth Electric Light Co., Ltd., with a view to giving a bulk supply of electricity from the Corporation's works at Newton Abbot. An electricity showroom is to be opened in Union Street.

**Uruguay.**—HYDRO-ELECTRIC UNDERTAKING.—*Commerce Reports* states that negotiations for a contract between the Uruguayan Government and an American company for the construction of a $15,000,000 hydro-electric plant are reaching their final stages, and it is expected that construction work on the project will be commenced during the early part of the present year.

**Wolverhampton.**—LOAN.—The Town Council has applied to the Electricity Commissioners for sanction to the borrowing of £38,314 for the extension of mains to Hilton and Cannock.

**Walsall.**—PROPOSED ELECTRICITY SCHEME.—At a meeting of the Walsall Town Council on February 11th a report was presented dealing with the present position of the North-West Midlands Electricity Supply Scheme. After referring to the previous draft scheme and other proposals, it was ultimately decided to press for an entirely new scheme, of which an advisory committee would form no part. The scheme, which is to be submitted to a second inquiry, provides that the first portion of a power station should be erected on the Severn to serve the southern district, and that the erection of the Rugeley power station be postponed. With regard to the northern district, it is proposed that the Stoke and Stafford power stations continue to work as separate undertakings for the time being, and that in due course the first section of a new power station should be at Barlaston, near Stone, with transmission lines to Stoke and Stafford. The scheme also lays down that it should be the first duty of the joint electricity authority for the southern district to link up the existing power stations at Ocker Hill, Wolverhampton, West Bromwich, and Walsall, and to lay transmission mains to Oakengates in order to supply that area and Wellington; also that consideration should be afterwards given to a further extension to Shrewsbury.

**West of Scotland Electricity District.**—LOCAL INQUIRY.—In pursuance of the provisional determination on December 23rd, 1921, of the above-named district, the Electricity Commissioners will hold a local inquiry in the Justiciary Buildings, Jail Square, Glasgow, on March 11th, 1924, at 10.30 a.m. and following days with reference to the area to be included in the proposed district and to consider a scheme which has been submitted by a Conference of Local Authorities, authorised undertakers, and others within the district for effecting an improvement of the existing organisation for the supply of electricity in the district and for the formation of an Electricity Advisory Board. Copies of the scheme and supplementary particulars in support thereof may be obtained from Mr. H. E. Ferguson, 53, Bothwell Street, Glasgow, and any representations should be addressed to the secretary, Electricity Commission, not later than March 3rd, 1924.

**Whitehaven.**—NEW PLANT.—The Town Council has applied to the Electricity Commissioners for sanction to a loan of £8,500 for the provision of a new generating set.

## Tramway and Railway Notes.

**Aberdeen.**—TRAMWAYS EXTENSION.—The Unemployment Grants Committee has made a grant of 50 per cent. of the interest on the loan for the proposed extension of the tramways to Hazelhead, *via* Queen's Road.

**Australia.**—SYDNEY.—According to the *Age*, Mr. Bradfield, city railway engineer, states that the first section of the underground system at Sydney to St. James's station will be opened in 1925. By that time the Illawarra line will be electrified, and there will be continuous train service between Waterfall, on the south side of National Park, and St. James. The general excavation for the new central station and the main portion of the Liverpool Street station are almost complete.—*Reuter's Trade Service* (Melbourne).

**Continental.**—SPAIN.—*Proposed Railway Electrification near Bilbao.*—It is reported that the Ferrocarriles de San Sebastian a la Frontera Francesa (San Sebastian to the French frontier), the Ferrocarril a Martutene y Hernani, and the Ferrocarril de Plazaola (San Sebastian to Pamplona, Nevarra), have formed a combine under the name of the Sociedad Explotadora de Ferrocarriles y Tranvias, for the purpose of electrifying the line to Pamplona, a distance of about 100 km. It is also planned to effect some improvements in the present line from San Sebastian to the French frontier. It is proposed to use hydro-electric power, which is available.—*Commerce Reports.*

Trials of electric traction on the mountainous section of the railway from Madrid to the coal mines of Asturias have been successfully made on the section between Ujo and Campomanes, a distance of eight miles. A speed of 39 miles per hour was obtained with engines pulling a train of 350 tons. D.c. at 3,000 V was employed.

**Lake District.**—PROPOSED ELECTRIC RAILWAY.—At a recent meeting of local authorities interested in the proposed railway from Windermere to Keswick, a letter was read from Mr. Noble Fell, of London, stating that the railway would be electrified. He added that a power station would be erected either at Keswick or Cockermouth, and that probably a cable would be laid along the line for the distribution of electricity to the districts adjacent to the railway.

**Liverpool.**—NEW DEPÔT.—The Corporation has had plans prepared for a new tramway works and car depôt in Edge Lane. It is intended to equip the proposed building for the construction and repairing of tramcars.

**London.**—TRAFFIC RETURNS.—During last year 1,345,000,000 passengers were carried by the trains on the Underground and the motor-'buses of the London General Omnibus Co., added to which the passengers carried by the motor-'buses and trams of the London and Suburban Traction Companies brought the total number to 1,625,000,000. The 1,345,000,000 passengers represent an increase of 174 millions over the preceding year, and is the largest number of passengers ever carried in the history of the companies. The car mileage of the railways amounted to 57 millions. Twenty-two escalators are now in operation at the Underground stations, and by the end of the year it is expected that 51 escalators will be in service.

NEW TRAIN-STARTING DEVICE.—Electric signal bells have been introduced at Charing Cross District Railway station. The new device consists of a suspended wire which extends for 180 ft. The guard depresses the wire, which causes an electric signal bell to ring at the front end of the platform. During the busy hours two bells, one in the front and the other in the centre of the platform, will be used. Tests with the bell device give an average saving of four seconds in the starting of long trains. This device is to be installed at all stations between South Kensington and Whitechapel.

**Salford.**—NEW ROUTE.—The Tramways Committee proposes to lay a loop line between Blackfriars Street and Lower Chapel Street.

**Shelf.**—RAILLESS TRACTION.—The Bradford Corporation proposes to run railless trolley vehicles in place of the present tramway system, but the Urban District Council has intimated its objection to the proposed scheme.

## Telegraph and Telephone Notes.

**France.**—POSSIBLE WEST INDIES CABLE SALE.—It is possible that the cable linking France with the West Indies may shortly pass into American hands. The Compagnie Française des Cables Telegraphiques is at present negotiating with an American group for the sale of the cable, but no arrangement has as yet been arrived at. The French company points out that if the cession of the cable does in fact take place, the sum thus realised will be employed solely for the carrying out of improvements and extensions of the rest of its cable system. The Compagnie Française des Cable Telegraphiques is controlled by the State; and is subsidised by the State when its receipts are insufficient, but this has not been the case for some years. The State's consent to the proposed transaction, the company affirms, has been obtained.—*Reuter* (Paris).

**Germany.**—RADIO-TELEPHONY AT SEA.—Following experiments conducted along the German coast last year, the German telegraph authorities are making preparations to establish radio-telephonic communication between liners at sea and telephone systems in Berlin, Bremen, Hamburg, and other German towns by means of the radio stations at Norddeich, Cuxhaven, and Swinemunde. According to the *Daily News*, it was possible, by means of the five-kilowatt transmitter at Norddeich, to send messages which were clearly intercepted by vessels when they were several days' journey south and west of the English Channel.

**Greenland.**—NEW RADIO STATIONS.—The Finance Committee of the Danish Folkething has agreed upon the necessary advance of 900,000 kroner for the erection of four radio stations on the Poulsen system in Greenland. Three of the stations will be equipped with continuous-wave, and the fourth with a spark transmitter for local traffic, for which two of the others are also to be equipped, while one is to be capable of communicating with Iceland, or, in favourable conditions, with the Faroe Islands and Europe. The contract goes to the Dansk Radio Co., with the stipulation that certain parts of the equipment shall be of Danish production. Work will commence in the spring.—*Financial News.*

**Italy.**—TELEPHONE AND TELEGRAPH IMPROVEMENTS.—During 1922, according to the report of the Ministry of Posts and Telegraphs, many improvements were accomplished, and considerable construction work was done. New technical material was introduced in some of the more important offices such as Genoa, Milan, Bologna, and Naples, and about 3,720 kilometres of telegraph and telephone wire, including new wire and replaced wire, was laid for internal service, and about 1,600 kilometres for international service. Telegraph connections were provided between Milan and Palermo by means of the Palermo-Naples submarine cable and the Naples-Milan radio service, and a telephone cable was laid in the Straits of Messina to connect Rome with Messina and Palermo. The following are the approximate statistics of telegraph traffic in Italy during the year, compared with 1921:—Telegrams accepted, 1922, 21,059,669; 1921, 23,094,820; telegrams delivered, 1922, 27,859,002; 1921, 30,487,890; telegrams transmitted, 1922, 52,546,119; 1921, 56,008,110; telegrams received, 1922, 55,196,337; 1921, 58,870,633. Contracts were also made during the year for the construction of subterranean telephone arteries between Genoa and Milan, Genoa and Turin, and Milan and Turin, as well as for the improvement of several of the larger exchanges. Radio communication increased, and the service was greatly improved during the year.—*Commerce Reports.*

**North Sea Cables.**—NEW LONDON-GERMANY CIRCUIT.—According to the daily Press, a new direct cable between Dumpton Gap, Margate, and Emden was inaugurated on February 12th, when the first telegraph message was sent from Electra House, London, to Germany, *via* the Eastern Telegraph Co.'s system.

**Portugal.**—TELEGRAPH EMPLOYES' STRIKE.—Following a meeting between the Minister of Commerce and representatives of the telegraphists and postal employés on strike, the latter agreed to advise a general resumption of work early this week.—*Reuter.*

**South Africa.**—LONG-DISTANCE TELEPHONY.—It is expected that a telephone service will shortly be available between Cape Town and Johannesburg, a distance of about 1,000 miles. At present Cape Town is in telephonic communication with Beaufort West, to the north, a distance of 339 miles, and Oudtshoorn, 387 miles to the east. Johannesburg has connections with Durban, a distance of 519 miles, and Bloemfontein, 290 miles.—*Commerce Reports.*

**Spain.**—TELEPHONE CONCESSION.—A concession has recently been granted by the Spanish Government for the establishment of an interurban telephone line between Salamanca and Matilla de los Canos (Province of Salamanca).

**West Indies.**—NEW BRITISH CABLE.—A scheme is on the eve of execution which will provide an all-British route (by way of Canada) between Great Britain and the West Indies, says the *Morning Post*, the Imperial Government having decided in favour of such a route. The preliminary steps are now being taken to inaugurate the scheme, and Parliament will be asked in due course for legislative sanction. An outlay of about £335,000 is contemplated in connection with the project, which falls into two parts. The first provides for the laying of an entirely new submarine cable from Turks Island to Barbados, with spurs to Trinidad and British Guiana. At Turks Island the new cable will connect with the Direct West India Cable Co's. line from Bermuda to Jamaica. The contract for this new cable has been awarded to Messrs. Siemens Brothers & Co., Ltd., whose tender amounted to £242,146.

NEW RADIO STATIONS.—In order to provide for improved communication with and between the Windward and Leeward Islands, seven radio stations are to be erected respectively at Barbados, St. Kitts, Antigua, Dominica, St. Lucia, St. Vincent, and Grenada. This work will be carried out by the Radio Communication Co., Ltd., whose engineer was due to arrive at Barbados on February 15th. The amount of the tender was £62,760. It is being arranged not only that the islands shall be able to communicate with one another, but also with ships. The sites of the stations are to be provided free of cost to the contractors.

The General Post Office will supervise the execution of both branches of the scheme, and representatives of that Department are proceeding to the West Indies. As regards the erection of the plant, the engineers will be associated with representatives of the Pacific Cable Board. Two Bills have been prepared. One will confer the required power on the Pacific Cable Board, which will operate the scheme when completed. The other Bill will seek Parliamentary authority for the proposed expenditure, which allows £30,000 for contingencies. The arrangements outlined were completed by the late Government.—*Morning Post.*

## Radio Notes.

**Broadcasting in the Theatre.**—A LONDON INNOVATION.—It will have become generally known by now that seatholders in the gallery and balcony at the Winter Garden Theatre are entertained during the period before the curtain rises, as arrangements were made a little while ago with the General Electric Co., Ltd., for "Gecophone" loud speakers to be installed in the auditorium to reproduce, between the hours of 7 p.m. and 8 p.m., the concert broadcast from 2 LO. For this purpose the gallery and balcony queues have been abolished, the public being admitted at 6.45 p.m. The Winter Garden Theatre is the first theatre in England to make the innovation, which has been a great success. There are two loud speakers, one on each side of the gallery, fixed on ledges on the wall about 12 ft. below the ceiling. The aerial, barely visible, is stretched across the auditorium near the roof over the stalls, its length being 50 ft. The operator works his instruments near a box on the dress circle level, and the earth lead is connected to the heating radiator.

**China.**—BROADCASTING IN HONG-KONG.—The Hong-Kong Radio Society now has a membership of 105; in June, 1923, the first transmitting and receiving sets were installed, and at present there are two of the former and about 500 of the latter in use. According to *Commerce Reports*, there is no market for sets which need storage batteries, owing to it being very difficult to get them charged in South China. The use of dry cells is therefore essential, with loop aerials whenever possible. Sets must have a receiving range of at least 500 miles, and h.f. amplification is necessary. Broadcasting is being done on a limited scale in Hong-Kong by the Hong-Kong Telephone Co., which operates a 100-watt American-made set daily (irregularly). The other station is operated by the Radio Communication Co., Ltd., which has a Canadian-made 10-watt transmitter with American valves, and is now installing a 1-kW station at Kowloon to serve South China, and expects to broadcast nightly. In addition, it is possible to receive three evenings a week from the Electrical Supply Co.'s station at Manila, and from the *Evening News* at Shanghai. No definite action has yet been taken by the Colonial authorities. The Government is awaiting the arrival of an expert from the Colonial Office in London, and will act on his advice.

**Northern Ireland.**—BROADCASTING STATION.—The British Broadcasting Co. announces that it has decided to open a main broadcasting station at Belfast as soon as possible, and that it will be similar in every respect to the London station, having a full programme and officials of its own. It is stated that engineers will be engaged in Belfast in a fortnight's time, and it is hoped that the new station will be functioning in three months. Mr. Norman Inglis, president of the Northern Radio Association, has been chiefly instrumental in bring-

ing the scheme for a broadcasting station in Belfast within the scope of practical realisation, as he has been in close touch with the British Broadcasting Co. for over a year, in addition to having visited the London studio in furtherance of the project.

**Radio-Broadcasting.** — NEW PROGRAMME.—The British Broadcasting Co., Ltd., is to give musical programmes between 1 and 2 p.m. on Tuesdays, Thursdays, and Fridays, beginning on February 26th. The chimes of "Big Ben" are also now broadcast on week-days at 7 p.m. and on Sundays at 3 and 8.30 p.m.

"WOMEN'S HALF-HOUR."—The women's half-hour in the daily broadcast programme is gradually to be altered with a view to giving two talks of about ten minutes each, divided by a musical interlude of the same length.

NEW STATIONS.—The British Broadcasting Co., Ltd., announces that the call signs of the new relay stations will be:—Plymouth, 5PY; Edinburgh, 2EH; Leeds, 2LS; Liverpool, 6LV; Hull, 2HU. It is also announced by *The Times* that the company is contemplating the erection of a high-powered broadcasting station just outside London. The new station, if the scheme comes to fruition, will be of 25-kilowatt power, or 16 or 17 times the power of the present station. The wavelength will be 1,600 metres. The idea is to reach areas at present inadequately served. The company has permission from the Postmaster-General to erect such a station for experimental purposes only, and the Government will have to be satisfied that it will not interfere with the Government services before a licence to erect it permanently will be given.

**South Africa.**—RADIO-BROADCASTING.—The Dominion had its first big radio demonstration last month, when for a fortnight concerts were transmitted from a station installed at Johannesburg by the Western Electric Co. The equipping of the station and the transmission were supervised on the technical side by Mr. F. H. Amiss, B.Sc., who was engineer-in-charge of the Birmingham station up to the date when it was taken over by the B.B.C. Before his arrival at Johannesburg he had been engaged in equipping a broadcasting station at Rome. The South African concerts were arranged by the Western Electric Co. with the object of raising funds for the South African section of the British Empire Exhibition, and they met with remarkable success.

**United States.**—"PENNY-IN-THE-SLOT" RECEIVER.—A nickel-in-the-slot radio receiving outfit has made its appearance in Washington. The receiver is equipped with apparatus which gives patrons advance information as to the immediate availability of radio entertainment and gives a warning 20 seconds before another nickel is due, so that they may enjoy an uninterrupted performance.—*Reuter.*

"WIRED WIRELESS."—After supplying "wired wireless" programmes successfully for 4½ months to a portion of the residents of Staten Island by means of the ordinary electric light wiring, the service is to be extended this spring over the entire island and to several cities near New York, says the *Evening News*, which explains that the scheme has proved to be practicable under actual service conditions and well adapted to the needs of non-mechanically inclined people. The receiver is plugged in to the lighting socket like an electric iron, and tuning is simply done by turning a knob. Receivers are not sold, but residents subscribe to the service, their monthly payment covering the use and maintenance of the instruments. The charge is 8s. per month for a head-'phone set and £1 for a loud speaker. At the studio an ordinary microphone conveys the speech and music over ¼ mile of wire to the electricity generating station of the Staten Island Edison Co., where the programme is sent out over the ordinary electricity distributing lines. It has been possible to re-radiate ordinary broadcast matter in this way, and it is stated that the new method causes no interference with normal radio communication, and the service has continued to operate when other broadcasting stations have been asked to close down.

# Contracts Open and Closed.

*(The date given in parentheses at the end of the paragraph indicates the issue of the* ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

## Open.

**Australia.**—MELBOURNE.—March 19th. Victorian Railways. One electrically-driven air compressor.*

Alternating-current induction motors, starting apparatus, and accessories.*

March 10th. State Electricity Commission. 100,000-V testing transformers. (See this issue.)

SYDNEY.—April 9th. N.S.W. Government Railways and Tramways. Electric overhead travelling crane. Ref. 15,139/ED/EC3.*

**Belfast.**—March 4th. Tramways Committee. Twelve months' supply of stores, including cable, lamps, carbon brushes, &c. (February 8th.)

March 10th. Electricity Department. Supply and laying of e.h.p., 3-phase cables, and the supply and erection of 1,000-kW rotary converters, with transformers, switchgear, &c. (February 15th.)

March 10th. Electricity Committee. Supply of materials for 12 months, commencing April 1st, including electrical accessories, street-box frames and covers, stoneware troughing and conduits, feeder and section pillars, cable connectors, meters, transformers, cables, joint boxes, &c. (See this issue.)

**Belgium.**—Tenders have this week been invited by the municipal authorities of Lierneux (Province of Liége) for the concession for the supply of electricity in the town.

February 26th. Provincial Administration of Western Flanders. Tenders for the supply and erection of an electric power distribution system for the communes of Nieuport, Coxyde, Furnes, Dixmude, Moere, and Ostend. The contract includes the installation of aerial high-pressure lines with all accessories, construction and equipment of the transformer cabins, and the supply and laying of an underground high-pressure line.*

February 25th. Schaerbeek Municipality. Supply of 1,000 5-amp., 110-V, single-phase electricity meters; and 500 metres of 3 x 30 x 20 armoured cable. Particulars from the Service de l'Electricité, Hotel Communal, Schaerbeek.

BRUSSELS.—March 6th. Municipal Council. Cables and accessories in connection with the electricity supply undertaking up to December 31st next. Particulars (2 fr.) from Hotel de Ville, Brussels.

**Birmingham.**—February 28th. Board of Guardians. Electric wiring installation at the Dudley Road hospital. Mr. James Curtis, clerk to Guardians, Union Offices, Edmund Street, Birmingham.

**Blackburn.**—March 1st. Board of Guardians. Electric lighting and power installation at the Institution laundry. Deposit £1 (returnable). Mr. C. E. Bygrave, Clerk, Union Offices, Blackburn.

March 12th. Installation of electric lighting in Blackburn Orphanage, Wilpshire. Particulars from secretary.

**Colwyn Bay and Colwyn.**—March 6th. Urban District Council. Sewerage pumping machinery, including three 10-b.h.p. electric motors. Mr. Robt. Green, chartered civil engineer, 37, Bennett's Hill, Birmingham.

**Croydon.**—March 3rd. Electricity Department. E.h.p switchgear; cooling towers and ponds; and cast iron circulating piping. (February 15th.)

**Denmark.**—COPENHAGEN.—April 2nd. Lighting Department. 6,000-V and 30,000-V switchgear.*

**Dover.**—March 17th. Electricity Department. One water-tube boiler. (February 8th.)

**Dundonald.**—Lochgelly Iron and Coal Co., Ltd. Various works, including electric lighting, required in the erection of 40 houses, and a new street. Schedules from Mr. A. D. Hoxton, architect, Leven.

**Dun Laoghaire (Kingstown) (Co. Dublin).**—February 28th (extended from 21st). Urban District Council. Crude oil engines and alternators; switchgear and transformers, distribution system (underground and overhead). (February 8th.)

**East Ham.**—March 10th. Electricity Department. Two 1,000-kW converters, one lighting feeder booster, one l.p., d.c. switchboard, two 6,600-V switchgear panels, e.h.p. and l.p. cables, and water-cooling plant. (See this issue.)

**Edinburgh.**—Education Authority. Work, including electric lighting, in connection with new elementary school, James' Place, Leith. Schedules from Mr. J. M. Johnston, architect, 47, Charlotte Street, Leith. Tenders to Mr. John Stewart, S.S.C., executive officer, Education Offices, Edinburgh.

March 10th. Electricity Department. One 1,500-kW and two 500-kW converters. (February 15th.)

**Falkirk.**—Electric lighting work in connection with 52 houses at Thornhill site. Specification, &c., from Mr. A. Balfour Gray, Town Clerk.

Electric lighting work in connection with housing scheme (second development) (80 houses). Written application to Mr. Wm. Gibson, Director of Housing, Arbotdale, Falkirk.

**Grimsby.**—March 3rd. Electricity Department. One 2-ton electric lorry. (See this issue.)

**Ilford.**—The Urban District Council Electricity Department invites tenders for the supply of a 500-kW converting plant. (February 15th.)

**Leeds.**—March 4th. Tramways and Highways Department. Miscellaneous materials, including (Sch. 12a) copper bonds; (Sch. 13a) electrodes. Mr. J. B. Hamilton, commercial manager, 1, Swinegate, Leeds.

March 29th. Electricity Department. One 12,000-kW turbo-alternator set, and steam turbine-driven surface condensing plant. (February 15th.)

**London.**—ISLINGTON.—February 25th. Electricity Department. Two electric dust collection vehicles, fitted with steel tipping bodies, and four horse-drawn street-watering vans. (February 8th.)

SOUTHWARK.—Board of Guardians. Electric lighting installation at the Newington Institution. (February 15th.)

**Luxembourg.**—April 1st. The Government of the Grand Duchy. (1) The supply of the electrical energy; (2) for the establishment and working of the distribution system; (3) for the generation of the electrical energy and the establishment and working of the necessary distribution system. Particulars may be obtained for 25 fr. from the Bureau d'Etudes et de Constructions pour l'Electrification de Grand-Duché, 3, Avenue de la Liberté, Luxembourg.

**Manchester.**—February 23rd. Public Health Committee. Supply, erection, and maintenance of a 112-cell storage battery at Baguley Sanatorium, Cheshire. (February 15th.)

**New Zealand.**—WELLINGTON.—February 26th. Post and Telegraph Department. Twenty miles of 1/20 copper wire, vulcanised rubber, insulated, taped and braided to specification No. 116.*

**Spain.**—March 25th. The Centro Electrotechnico in Madrid is inviting tenders for the supply of an electricity generating set required in connection with a wireless telegraphy station.

**Stoke-on-Trent.**—March 12th. Electricity Department. Neutral earthing resistance; three steam turbine-driven feed pumps; 600-Ah secondary battery. (February 15th.)

**Uruguay.**—MONTEVIDEO.—March 31st. State Electricity Supply Works. Six generating sets, complete with accessories and spares, consisting of Diesel oil engines and generators directly coupled.*

**Whitehaven.**—February 29th. Corporation Electricity Department. A 1,000-kW geared d.c. turbo-generating set, complete with condenser pumps and pipework. (February 15th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

## Closed.

**Barnes.**—Fire Brigade and Lighting Committee. Provisionally accepted:—

One mile of .2 x .2 x .1 x .01 sq. in. cable (£1,000).—Macintosh Cable Co., Ltd. The electrical engineer reports as follows:—"The lowest tender was received from a company with whom we had previously done business, and although their cable may be as good as any of the others, I thought it advisable, in view of the small difference in the cost, to place the order with a firm whose class of manufacture we are acquainted with. The Cable makers Association appears to have now absorbed the major portion of the cable manufacturers, and I think that for the future it would be advisable to invite tenders from foreign makers in order that prices may be checked."

The Committee has passed a resolution giving effect to this proposal.

**Belgium.**—La Société des Usines à Cuivre et à Zinc, of Liége, last week submitted the lowest tender to the Belgian State Railway authorities in Brussels for the supply of 1,000 metres of bare cable.

**Greenwich.**—Board of Guardians. Accepted:—

Electric cable from the Hospital to the Institution (£327).—W. T. Glover and Co., Ltd.

**India.**—During last month the Indian Stores Department, Delhi, placed a contract with the India Cable Co., Ltd., of Calcutta, for the supply of 148 coils of 100 yds. of single electric cable.

TATA POWER CO.

Five water turbines and generators with an aggregate output of 150,000 h.p.—English Electric Co., Ltd.

**Keighley.**—Tramways Committee. Recommended:—

Six double-deck railless vehicles; four single-deck vehicles; and four chassis for single-deck vehicles; and the reconstruction of a portion of the overhead equipment (£26,964).—Clough, Smith & Co., Ltd.

Electricity Committee. Recommended:—

One 5,000-kW turbo-alternator (£15,758).—Fraser & Chalmers, Ltd.
Surface condenser (£3,696).—W. H. Allen, Sons & Co., Ltd.
Two water-tube boilers, &c. (£17,340).—Babcock & Wilcox, Ltd.
A tender received from a Swiss firm for the supply of the turbo-alternator was £5,000 below the lowest British tender.

**London.**—ST. MARYLEBONE.—Installation of a telephone system at the Baths establishment. The following tenders were received:—

| | |
|---|---|
| Telephone Installations (London), Ltd. ... ... ... ... | £122 |
| Electrical Contracts and Maintenance Co., Ltd. ... ... ... | 110 |
| Reliance Telephone Co., Ltd. ... ... ... ... ... ... | 98 |
| **Private Telephone and Electric Co., Ltd.** (Recommended.) | 82 |

STEPNEY.—Electricity Committee. Recommended. The following tenders have been received for the supply and erection of steam bottles, pipes, valves, &c., at the Limehouse station:—

| | |
|---|---|
| **Vickers-Spearing Boiler Co., Ltd.** (Recommended.) ... | £2,118 |
| Babcock & Wilcox, Ltd. ... ... ... ... ... ... ... | 2,270 |
| Foster Bros., Ltd. ... ... ... ... ... ... ... ... | 2,329 |
| J. E. & S. Spence, Ltd. ... ... ... ... ... ... ... | 2,450 |
| Stewarts & Lloyds, Ltd. ... ... ... ... ... ... ... | 2,639 |

Accepted:—

Maximum demand indicators (second-hand, requiring reconditioning).—Hampstead Borough Council (100 at 12s. 6d. each); Chamberlain and Hookham, Ltd. (286 at 10s. each).

**Prestwick.**—Town Council. Accepted:—

Installing electric lighting in the Burgh Chambers (£91).—Reid & Co.

**Rothesay.**—The following contracts have been placed:—

Street cable works.—British Insulated & Helsby Cables, Ltd.
Main switchboard.—Metropolitan-Vickers Electrical Co., Ltd.

**Sheffield.**—Tramways Committee. Accepted:—

20 double-deck vestibule tramcar bodies and trucks (£24,150) and 2 trucks, complete (£6,100).—Brush Electrical Engineering Co., Ltd.
50 traction motors (£11,700).—British Thomson-Houston Co., Ltd.

Electricity Committee. Accepted:—

One 12,000-V, 800-A, 3-phase oil switch (£184); three 11,000-V, 100-A oil-immersed switch fuses (£207); and 24 e.h.p. sub-station switch panels (£3,857).—A. Reyrolle & Co., Ltd.

**Southern Railway.**—Electrification of the South-Eastern suburban lines.

125 miles of h.p., 3-core cable.—Johnson & Phillips, Ltd.

**Sunderland.**—Corporation. Accepted:—

Turbo-generator and auxiliaries.—Fraser & Chalmers Engineering Works.
Boiler-house equipment.—Clayton & Shuttleworth, Ltd.
Cooling towers.—Davenport Engineering Co., Ltd.

**Trowbridge.**

Installing electric lighting at the Barracks (about 230 lights).—Edwards and Armstrong.

**Winchester.**—Town Council. Accepted:—

Motor-generator set (£210).—Electric Construction Co., Ltd.

## Forthcoming Events.

**Northampton Engineering College Engineering Society.**—Monday, February 25th. At the College, St. John Street, E.C.1. At 5.30 p.m. Paper on "Thermionic Valves," by Mr. W. Bond.

**Institution of Electrical Engineers.**—INFORMAL SECTION.—Monday, February 25th. At the Engineers' Club, Coventry Street, W. At 7.30 p.m. Annual smoking concert.

Thursday, February 28th. At the Institution, Victoria Embankment, W.C. At 5.30 p.m. Special general meeting of corporate members for the purpose of altering the by-laws.

At 6 p.m. Paper on "The Design of Apparatus for the Protection of Alternating-current Circuits," by Mr. A. S. Fitzgerald.

**(North-Eastern Centre).**—Monday, February 25th. At Armstrong College, Newcastle-on-Tyne. At 7.15 p.m. Paper on the "Design of Apparatus for the Protection of Alternating-current Circuits," by Mr. A. S. Fitzgerald.

**(North-Midland Centre).**—Tuesday, February 26th. At the Hotel Metropole, Leeds. At 7 p.m. Paper on the "Design of Apparatus for the Protection of Alternating-current Circuits," by Mr. A. S. Fitzgerald.

**(North-Western Centre).**—Friday, February 29th. At the Midland Hotel, Manchester. At 7 p.m. Annual dinner.

**Institute of Marine Engineers.**—Tuesday, February 26th. At the Institution, The Minories, E. At 6.30 p.m. Paper on "Electricity as the Motive Power for Ships," by Mr. L. Rothera.

**Paisley Association of Electrical Engineers.**—Tuesday, February 26th. At 30, High Street. At 7.30 p.m. Paper on "Design of a Town Distribution System," by Mr. W. R. Fitton.

**Greenock Association of Electrical Engineers.**—Wednesday, February 27th. At 22, West Stewart Street. At 7.45 p.m. Paper on "Overhead Transmission Lines," by Mr. G. N. Holmes.

**Royal Institution of Great Britain.**—Thursday, February 28th. At 21, Albemarle Street, W. At 5.15 p.m. Lecture on "Crystalline Structure of Organic Substances," by Sir William Bragg, F.R.S. (Lecture IV.)

**Junior Institution of Engineers.**—Friday, February 29th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecture on "The Manufacture of the Incandescent Electric Lamp," by Mr. W. A. Rhind.

**Birmingham and District Electric Club.**—Friday, February 29th. At the Grand Hotel, Colmore Row. At 7 p.m. Annual dinner.

## The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

ANTI-VOLTON insulating material.
HASLER tachometers.
COMA milling and grinding attachment.
CASTLE vacuum cleaners.
IRON-CLAD interlocked switch plugs (25 amp. continuous) suitable for fitting to cookers.

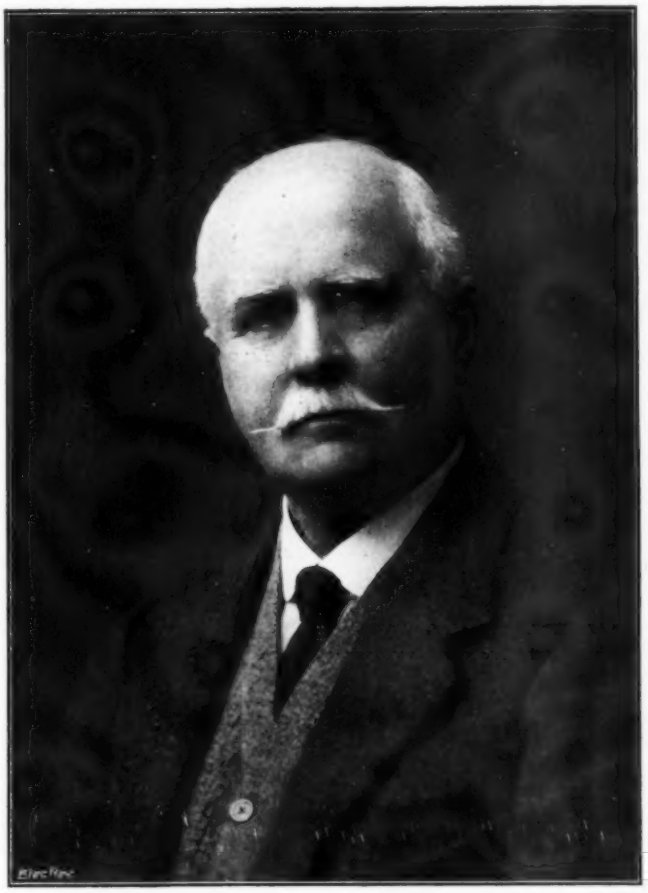
**Cleaning Gases by Electrical Precipitation.**—During the last few years great advances have been made in this country in the cleaning of the gases from blast furnaces by the electrostatic method. The most recent development is the application of this system to ferro-manganese blast furnaces for the removal of the dust in the gases. The Darwen & Mostyn Iron Co., Ltd., Chester, is now installing at its Mostyn Works a plant for cleaning the gases from ferro-manganese furnaces, and it will be the first electrical precipitation plant in this country working solely under these conditions. The plant is being constructed on similar lines to the "Cottrell" type installation at the Workington Works of the United Steel Co., Ltd., which has for two years been cleaning the gases from blast furnaces producing hematite iron and was installed by Messrs. Huntington, Heberlein & Co., London. The Darwen and Mostyn Iron Co., Ltd., is installing the plant itself under licence from Messrs. Lodge-Cottrell, Ltd., Birmingham. Mr. N. G. Barraclough, of Workington, is acting as consulting engineer, and the Pearson & Knowles Coal & Iron Co., Ltd., Warrington, is carrying out the constructional work.

# A Jubilee Celebration, 1874-1924.

## Mr. HENRY ALABASTER.

On Friday last a function of unique interest and rejoicing to those immediately concerned, and, we venture to believe, of scarcely less interest to very many of our readers, was performed, when the staff of the ELECTRICAL REVIEW signalised the completion of his 50 years' association with that journal by a dinner in honour of Mr. Henry Alabaster, chairman of the board of directors.

Mr. Alabaster became chief proprietor of the ELECTRICAL REVIEW in February, 1874, when it was known as the TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW, and he has retained that position to this day, manifesting throughout the keenest interest in every feature of its organisation and every phase of its development, and aiming always at the maintenance of the highest standards of probity and honour, whilst the beneficence of his policy towards the staff may be inferred from the fact that 18 members of it, all present at the dinner, have been in the firm's employ for over 20 years, their period of service averaging over 30 years, and of these 11 have served over 30 years each, with an aggregate of 371 years and an average of nearly 34 years. Some sixty sat down to dinner, and spent a happy evening together, of which there follows a brief account; a more extended report appears elsewhere in this issue.



*Pestel]* *[Eastbourne*

**Mr. Henry Alabaster.**

Mr. A. H. Bridge (commercial editor) proposed the health of "Our Guest." After recalling the jubilee of the REVIEW, which was celebrated in 1922, he drew attention to the unique position which was occupied by the "trinity"—H. Alabaster, Tom E. Gatehouse, and H. R. Kempe—in relation to the electrical industry in those years when it possessed no representative sectional associations; no three men had been privileged to wield such power and influence in the electrical industry as they, and their influence had always been for good. That night they rejoiced in the presence of Mr. Alabaster in the hey-day of his youth, when the sapling that he had nourished had spread its strong branches throughout the whole electrical industry, and his aim to establish it on a basis of stability and permanency was attained. The speaker referred to the quality of human kindness which characterised the "trinity"; whilst they admired his business qualities, it was Mr. Alabaster's thoughtfulness that they esteemed most highly—his kindly sympathy and personal charm that endeared him to them; he had always been ready to "help a lame dog over a stile," and to put a friendly hand on the shoulder of a man who was down. Long might he enjoy health and strength to watch over the interests of the ELECTRICAL REVIEW!

Mr. W. H. Wicken (foreman printer), in supporting the toast, bore testimony to the high esteem in which Mr. Alabaster had always been held by the staff of the composing department since its inauguration; they wished him many years of health and happiness.

The toast was honoured with the greatest enthusiasm, and the familiar refrain, after which Mr. W. B. Warwick (engraver), on behalf of the staff, presented Mr. Alabaster with mementoes of the occasion.

Responding to the toast, Mr. Henry Alabaster quoted a paragraph from *The Times* of recent date which declared two things essential to success—"one is to have a clear and unmistakable aim, a very resolute purpose. The other is to pursue this aim with unfailing pertinacity. . . . ." The aim of the REVIEW had always corresponded to these maxims; it had, above all things, aimed to be perfectly straight in all its dealings, both with its staff and with its clients, and always to give the best value possible in return for the support it received. As for "persistence," in the early seventies he had a very anxious time, when there was very little to write upon, and he was quite alone. But the staff grew; in 1881, Mr. T. E. Gatehouse, on the advice of Mr. H. R. Kempe, joined him as editor; in 1882 the publication became weekly, and since then expansion had proceeded continuously. Now, after 50 years of work and development, they had an editorial and publishing staff of 26; the compositors engaged solely on the REVIEW numbered 24; over 100 printers were employed for the REVIEW weekly; and the number of outside writers and contributors exceeded 250, making a total of 400 employed in its weekly production. It had been said that success depended upon "ability to select the right man for the right place"; and one very agreeable feature of his business connections had been the long and continuous service of so many of the staff, exceeded only by the longer connection of one whose name was known world-wide—Mr. Harry Robert Kempe, who wrote in the earliest issues of the paper, and still retained his interest in it. The sympathy and faithful services of the staff had been of the greatest value, and he gratefully expressed his high appreciation of those services.

F

# Industrial Developments in China.

By H. A. FLEET, A.M.I.E.E., Tientsin, North China.

A MARKED feature of the industrial development in China is the rapid extension of the application of electricity for driving textile machinery. During the past few years numerous new mills have been erected, and China's cotton spinning industry is steadily expanding.

In 1902—just over 20 years ago—there were about 20 mills, having a combined number of spindles of about half a million; to-day the mills have increased over threefold, and the aggregate number of spindles is well over one million and a half, with several mills under construction and others projected. A good deal of Japanese capital is invested in this industry, and the Japanese are credited with operating about one-third of the total number of spindles, whilst British-owned mills have less than half the number of spindles credited to the Japanese.

Fig. 1.—General View of Heng Yuen Cotton Mill.

Most of the mills confine themselves to spinning the lower counts of yarn, up to 20's, as the Chinese-grown cotton being mostly of short staple is more suitable for spinning these lower counts, although some of the most recently erected mills are beginning to spin up to 42's.

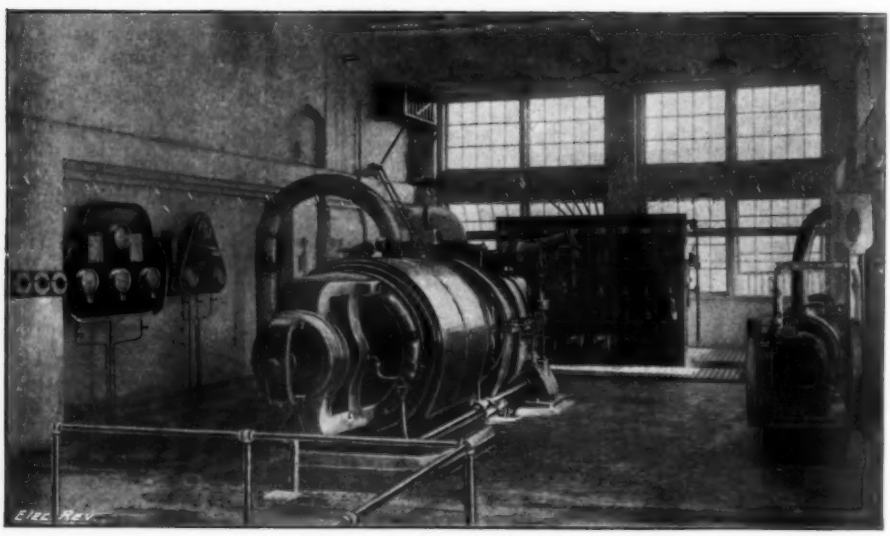


Fig. 2.—750-kW Turbo-Alternator.

The Heng Yuen cotton mill, which is here illustrated, is a typical example of an up-to-date cotton mill erected in China. It is situated on the bank of the river Hai-ho at Tientsin, North China, a little to the north-west of the Governer's Yamen, and is thus able to make use of the waterway for transport and utilise it for condensing purposes. It is also conveniently situated for the transport of material by railway.

The power plant consists of one 1,250-kW and one 750-kW General Electric Curtis turbines, with three-phase alternators, three American Stirling, and two English Stirling boilers, together with the necessary switchgear and apparatus for a complete plant. At the present time 20,000 spindles and 200 looms are in operation producing drills, sheetings, and canvas. These cloths are beginning to compete with similar productions from Japan, and the Chinese Government has for some time past accorded special duty treatment to locally manufactured products, which usually takes the form of exemption certificates, which, on payment of one 5 per cent. (*ad valorem*) duty, free the manufactured goods from all further taxation in China, and also from export duty when sent abroad, which is a great inducement to foster the industry. It may be noted that the power plant is in excess of the present needs, but it has been installed with a view to early extensions.

The mill covers an area of about 16 acres, and a substantial amount of ferro-concrete work is introduced in many of the buildings; special houses are built in the mill compound for the accommodation of the employés, and the average number of work-people employed is about 1,500, which comprises the day and night shifts. I believe this is the only mill in China that refuses to employ female labour.

The Chinese Government is endeavouring to encourage cotton growing, and there are officially recognised guilds established for the study of cotton cultivation; large tracts of land have been taken over and laid out as shown (see sketch, fig. 4) for the cultivation of cotton and rice.

The area to be cultivated is marked off into rectangular plots about 50 yards wide and 200 to 300 yards long; each alternate plot is then excavated to a depth of about 3 ft., and the earth thrown up forms a high land for planting cotton, whilst the low ground is planted with rice. This gives employment to a large number of coolies.

Fig. 3.—Power House.

The history of the development of many industries has demonstrated the fact that a material reduction in the cost of any manufactured article has almost invariably been attended by an increase in the demand, which subsequently means the employment of more labour, and the more labour that can be absorbed in the development of industries in China, the more advantageous it will be for the well-being of the people and the country in general; as their purchasing power increases this will be reflected in the exports of other countries by an increase in their oversea trade. There are distinct indications of the expansion of industries in the areas where electric power is available, and new industrial centres will be formed where fresh enterprises seeking outlets for capital to extend industries will erect works, and where the transport facilities are good and the value of land is comparatively small. The workers will naturally follow the work, and with more constant and regular employment in healthy industries, the conditions of living will be improved, and this will tend to reduce the large number of people who at present are entirely dependent upon the products of the land, and who often through famine, or other casualty are unfortunate victims who suffer many great hardships. With increased railway facilities and more rapid methods of transportation it will be much easier for the people to mix with each other to interchange ideas and exchange commodities, and this will tend to minimise to a large extent the number of sufferers in those areas affected by famine.

The American manufacturers appear to be fully alive to the potential market for machinery and manufactured products in the development of industries in China, from the support which is given to their selling organisations; the expenses at present incurred by these will in due course prove justified, and unless British manufacturers are prepared to incur the expense of having fully qualified engineers as representatives, they must not be disappointed if their share of the import trade of China fails to improve. Time must elapse before new markets can be developed, and as the accustomed channels for trade in a large area of Europe are stagnant, due to the fluctuation of the exchange, it is

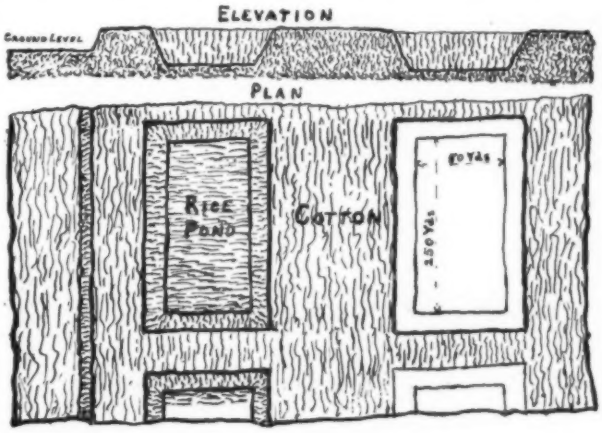



Fig. 4.—Method of Cultivating Cotton and Rice.

well worth the consideration of British manufacturers to concentrate on the cultivation of a field, where the currency value to-day is higher than the pre-war standard.

It may be of interest to manufacturers who are contemplating the export of electrical machinery to China, suitable for use in cotton mills, to know that in Tientsin and Shanghai, where there are no fewer than roughly 70 mills operating spindles varying in number from about 5,000 to 150,000, a number of these are not yet driven by electric power.

The manufacturer not acquainted with conditions in China may be discouraged by accounts of lawlessness and brigandage of which one so frequently reads in the daily newspapers. Such troubles are usually confined to the interior, and in no way affect the treaty ports, where capital may be invested and work undertaken at a risk to the investor little if any more than if the mill were situated in Lancashire.

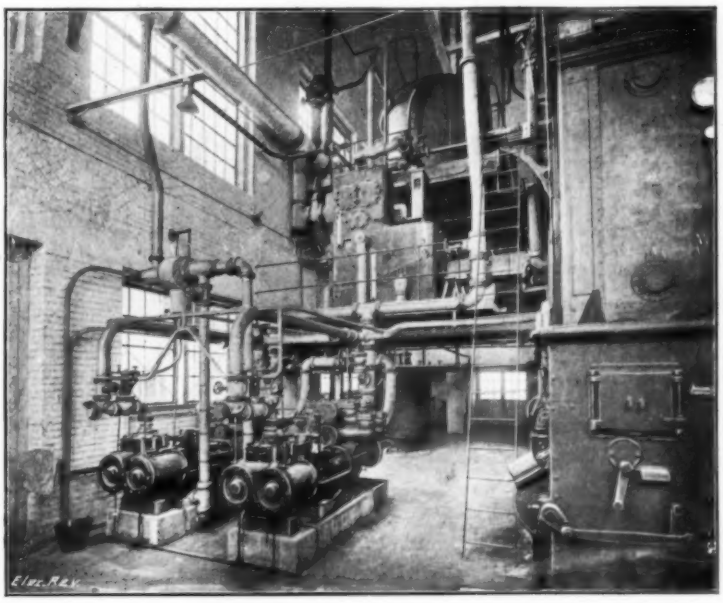


Fig. 5.—Boiler-House Interior.

# The Sterling Telephone Works.

## The Manufacture of Radio Apparatus.

By the courtesy of the managing director of the Sterling Telephone and Electric Co., Ltd., Mr. Guy Burney, we were recently enabled to pay a visit to the company's telephone works at Dagenham, where the buildings which were extended for the manufacture of munitions during the war have been largely devoted to the production of radio headphones, loud speakers, receiving sets, &c., in addition to the telephone and switchboard work for the Post Office, in which the company has been engaged for many years. Since the factory was established in 1909 it has been extended at frequent intervals, and enlargements are now again in progress. It is provided with a modern power house containing six English Electric 150-kW dynamos driven by Browett Lindley vertical gas engines, deriving their fuel from Crossley suction gas producers: a Metropolitan-Vickers 250-kW rotary converter has also been installed, which is supplied with electricity at high pressure by the County of London E.S. Co.

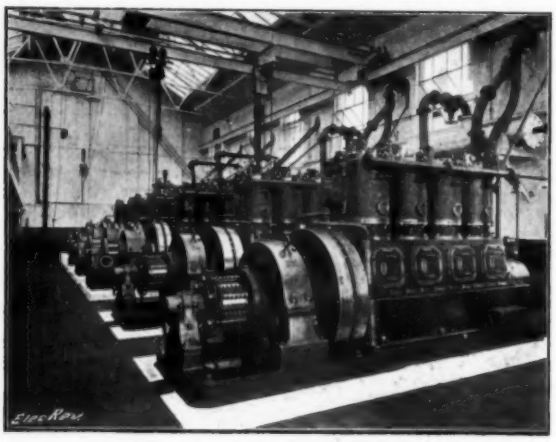


Fig. 1.—Power House.

Near the power station is a building covering over 12,000 sq. ft., in which are kept large stocks of the completed apparatus which the company manufactures for the Post Office (such as c.b. and magneto switchboards, and small P.B.X. switchboards), wireless sets, headphones, &c., ready for immediate dispatch to the head office.

Fig. 2.—Loud-Speaker Assembly Shop.

In an adjoining building—the cabinet works—up-to-date machinery is engaged in the "mass production" on a large scale of all the woodwork required for the company's manufactures. This is a very fine shop, unobstructed by columns, so that the machines can be placed in the most advantageous positions; they are driven from below the floor, and all débris is removed by exhaust air ducts. Three large drying kilns are provided, in which timber is treated for three weeks before use. Exceptionally interesting processes have been devised for polishing woodwork, resulting in an excellent finish.

There are several shops devoted to the winding of the coils which form so essential a feature of "wireless" apparatus in the shape of headphones, transformers, inductances, &c.

Fig. 3.—Wireless Instrument Assembly Shop.

Large shops are devoted to metal spinning and polishing, as well as to plating, moulding, stove enamelling, &c., in the production of the trumpets and flares of loud speakers, and ingenious methods are employed for decorating these with floral designs by most simple means. The main machine shops for the service of the whole factory are equipped with all kinds of metal-working machines, employing the services of 180 skilled mechanics in the tool room, where all the tools, gauges, jigs, &c., used in the works are produced.

Fig. 4.—Radio Testing Department.

In the large radio assembly shop a great variety of apparatus is built up from the component parts—Sterling "square-law" condensers, folding loop aerials, variometers, anode reaction units, &c.—the design and construction of which were extremely interesting to study. The electrical "interiors" are assembled complete, ready for insertion in the cabinet work in a special assembly shop which is kept warm and dry; metal panels

are used for the radio sets instead of ebonite, over which they possess marked advantages, in respect of their stability of form and their screening qualities. The valve holders are mounted in a patented device which eliminates the effects of vibration. Every set is tested in the radio test rooms, where the new "Threeflex" receiver, 4-valve, 2-valve, and crystal receivers, amplifiers, power amplifiers, and loud speakers are to be seen undergoing stringent tests; in addition, every set is subjected to a final performance test which is carried out during the evening broadcast programme, with the aid of 25 out-door aerials. An important part of the work is the manufacture of "Marconiphones," of which large numbers were in progress at the time of our visit.

Having on previous occasions described the Sterling workshops which are engaged in the manufacture of standard telephone material, turning out enormous quantities, we have here referred mainly to the shops devoted to radio telephone work. All the radio receiving instruments at present manufactured by the company are designed by Mr. D. Ward Miller, chief radio engineer, whilst Mr. F. R. Griffiths, chief telephone engineer, is responsible for the telephone side of the business, including radio headphones and loud-speakers, as well as telephone and switchboard work for the Post Office. Mr. Max R. Lawrence is the works manager, and to all these gentlemen we are indebted for the courteous assistance that we received from them on the occasion of our visit.

## Notes.

**The Supply of Electricity by Gas Undertakings.**—In the course of a visit by members of the Midland Junior Gas Association to the works of the Sutherland Meter Co., Ltd., Mr. Reginald Clarry, M.P., one of the directors, according to *The Gas World*, said that since he had left the gas industry he had been able to get a perspective of gas from another point of view. In addition to viewing it as a stable and necessary industry, he could see that electricity had an enormous field as well. One entirely in the gas industry was liable to take a more or less prejudiced view of things; but looking at it from a broad aspect, from the position of the man-in-the-street, there was ample room for both, and his view was—with a distinct leaning to gas—it would be to the advantage of the country if gas undertakings could also be suppliers of electricity as well. He was going to attempt during the next session of Parliament to bring in a small item of legislation which would make it easier for gas undertakings to supply electricity. That would be all to the advantage of small country districts where there was not room for two separate establishments. The gas industry should be the paramount suppliers of a public necessity of this kind.

**The National Association of Supervising Electricians.**—ANNUAL DINNER.—On Saturday last the annual dinner and musical evening of the Association was held at the Holborn Restaurant, London; the president, Mr. W. E. Highfield, M.I.E.E., occupied the chair, and there were present some 153 members and guests. After the loyal toast had been duly honoured, Dr. Alexander Russell (president, I.E.E.) proposed "The President and the Association"; he remarked that that body had existed for nine years, and for four years had been a registered trade union. Its history had been notable for the good feeling which had subsisted between employers and employed, and it had maintained a very high standard of qualification for membership. By its educational work it had raised the standard of workmanship throughout the industry, and the Institution of Electrical Engineers profited by its co-operation.

Mr. W. E. Highfield, M.I.E.E., responding, said that the members of the Association owned a high sense of duty as citizens of the Empire, to which he attributed the smoothness with which its work was carried on. The officials and members of committees worked very hard, and steady progress resulted, the membership being increased whilst the standard of qualification was fully maintained. Membership of the Association was recognised as evidence of ability, and unemployment within its ranks was practically unknown. He expressed gratification at the presence of Dr. Russell and Mr. Frank Gill.

Mr. J. S. Highfield, past-president, I.E.E. and of the Association, proposed "Our Guests," expressing his pleasure in voicing the hospitable feelings of the N.A.S.E. as a host. The president and past-presidents of the I.E.E. were present because the Institution was the adopted parent of the Association. Mr. A. H. Allen, M.I.E.E., and Mr. Frank Gill, past-president I.E.E., responded; Mr. Gill referred to the enormous importance of communications, and stated that it was now possible to hold conversation over any distance on the earth; that was not a commercial proposition as yet, but the work of making measurements was steadily going on. The Association was recognised as one which did useful service, to the public benefit; engineers could do a great deal more than they had done in the past, and that Association set a very high example.

The speeches were interspersed with a lengthy programme of music, song, and story, and the evening was thoroughly enjoyable.

**New Coolidge X-ray Tube.**—A new water-cooled X-ray tube, which will make possible the shortening of the period of radiation of malignant tumours from several hours to less than fifteen minutes, has been developed by Dr. W. D. Coolidge, of the General Electric Co., U.S.A., who has reported on his invention to the American Medical Association. Heretofore, in the treatment of cancer it has been necessary to use tubes with low amperage over long periods of time, the exposure to the rays being in some cases as long as 24 hours. The new tube permits the use of currents as high as 50 milliamperes to secure a voltage of 250,000, reducing the time of treatment in ordinary cases to less than five minutes.—*Science Service.*

**United States Electric Vehicle Market.**—With total sales of 140 electric trucks since January 1st, Chicago easily leads all other towns in the volume of business done during the period January 1st to 24th; among the orders placed were 50 for a bakery and 27 for a power company. One Chicago truck manufacturer has booked contracts for 116 vehicles since the first of the year. Business in the New York district has not been so active as in December, but manufacturers report that their plant is still operating at capacity on old contracts. The Westcott Express Co., of New York, bought 10 trucks and the New York Transfer Co. ordered two. The Washburn-Crosby Co., one of the largest flour milling concerns in the world, recently placed an experimental order for one two-ton truck for use in New York City. The Iroquois Gas Co., of Buffalo, N.Y., purchased four five-ton trucks, representing the initial installation of this company; these vehicles will replace gas trucks and horses. The New York Edison Co. will buy about 35 trucks this year.

An exhibition of electric trucks will be one of the features of the annual Electrical Show to be held in New York from April 19th to 26th. The Electric Transportation Club of Chicago, which was organised last November, is reported to be doing excellent work. The importance of the electric truck as a producer of revenue for power companies was shown in the annual report of the American Express Co., which operates 1,500 electric vehicles in more than 30 towns; in New York City alone the company used 2,080,000 kilowatt-hours in 1923. A big display of electric vehicles will be made on the "Million Dollar Pier" at Atlantic City in May, during the convention of the National Electric Light Association. Nineteen electric trucks and passenger cars, valued at 22,251 dollars, were exported from the United States during November, 1923. —*Reuter's Trade Service* (New York).

**Local Society.**—ILLUMINATING ENGINEERING.—Mr. Lawrence M. Tye, London, lectured on "Illuminating Engineering" to the Edinburgh Architectural Association on February 14h. Having referred to the need for good lighting arrangements in class-rooms, the lecturer pointed to the detrimental effect of inefficient lighting in factories, and mentioned that good lighting meant better work.

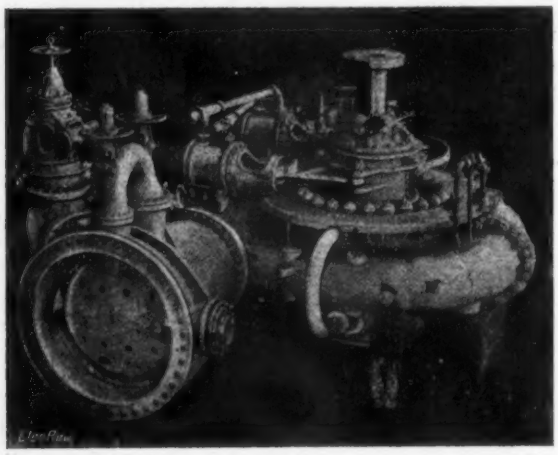
**Aurora Borealis.**—According to the *Daily News*, it is announced that Professor Vigard, working at Christiania University, has made an important discovery regarding the meteorological phenomena popularly known as the Northern Lights, which has led the Professor to confirm his theory that the earth's atmosphere outside the air strata surrounding it is closed up as if by a balloon skin consisting of solid crystalline nitrogen. He maintains that the temperature of the high air strata is so low that nitrogen vapour becomes solidified in crystal form. These nitrogen crystals account for the hitherto inexplicable green line in the spectrum of the Northern Lights. It is also held that the stratum gives the sky its blue colour and makes radio telegraphy possible, as without this wall electric waves would lose themselves in the ether instead of travelling round the earth.

**An Electrical Speech Controller.**—The following note from *Electrical Merchandise* deals with a method of controlling after-dinner speakers which would find ample scope in this country:—A traffic signal tower was used recently in New York City during a dinner given by friends of William Chilvers in the Fifteenth Assembly District, in celebration of his election to the Municipal Court bench, to notify the speakers, of whom there were fifteen, when to go ahead and when to stop. The toastmaster explained that each speaker would have seven minutes from the time the amber light was shown. When he had spoken five minutes, continued the toastmaster, the red light would be flashed on as a warning, and after two minutes more the green would be shown to indicate it was the toastmaster's turn again, to announce the next speaker.

**Platinum in South Africa.**—The *South African Journal of Industries* reports that platinum has been discovered in the Transvaal in quantities which are expected to be large enough to reduce the price of the metal materially. Several companies are now exploiting the deposit, which is situated about 100 miles north of Johannesburg; the lodes are known to extend for a distance of 10 to 15 miles, with many outcrops.

**Commercial Vehicle Parade.**—The annual parade of commercial motor vehicles organised by the Commercial Motor Users' Association is to be held on April 12th, and a new feature will be the section for advertising merit in bodywork, in which originality will count in the marking.

**Reaction Turbine to Operate Under an 860-ft. Head.**—In our issue of December 14th last (p. 902) we referred to the construction of reaction turbines for operation under a head of 860 ft., which is believed to be the highest head under which a turbine of this type has hitherto been worked. The



**Reaction Turbine to operate under an 860-ft. head.**

*Journal of Electricity* announces the completion of one of these machines and publishes an illustration of it which is reproduced herewith. The turbine was built by the Pelton Waterwheel Co. for the Portland Railway, Light and Power Co. It operates at 514 r.p.m., driving a 25,000-kVA vertical generator.

**Another Electrically-driven Ship.**—The American General Electric Co. has received an order from the Atlantic Refining Co., of Philadelphia, for electric propelling equipment for converting to Diesel-electric drive one of its bulk gasoline carriers for coastwise service. Two 225-h.p. Ingersoll-Rand Diesel engines will be used, each driving one 155-kW main generator and a 26-kW auxiliary generator. The two generators will be connected in series and will drive a single 370-b.h.p. propelling motor. Control will be of the Ward-Leonard or voltage type, arranged for operation from the pilot-house only. When the craft is in port one of the main generators will be used for furnishing power for driving the cargo pumps.—*Electrical World.*

**Electricity in the Dairy.**—There is probably no article of food so susceptible to contamination as milk, and since this forms the staple food for children and invalids, it is essential that every precaution be taken to ensure delivery, with all its cream, perfectly fresh and clean. The installation of Messrs. Curtis Bros. & Dumbrill, Ltd., Streatham, is probably the first of its kind in this country. The milk is delivered to Valley Road from the farms, *via* road and rail, in churns. From these it is tipped into a tank on the receiving platform, and immediately pumped into the milk storage tank at the top of the building. The milk is kept in agitation in the storage tank by means of a propeller, to prevent the cream setting, and passes from there by gravity over a preheater, thence into clarifiers which extract all impurities and foreign matter, and from these into "Cherry" pasteurisers, where it is raised to and kept at a specified temperature for some time, after which it passes over coolers, reducing it to near freezing point (thus completing the "massacre of the innocents"). From the coolers, still by gravity, the milk passes on to the bottle-filling and capping machines, and is crated, and the full crates move by conveyor to the cold store, ready for dispatch to the distributing depôts.

Dirty bottles are returned from the distributing depôts, in the crates in which the full bottles were sent out, to the bottle-washing room. The crates, filled with bottles, are fed into a machine where they are in turn washed with tepid and hot soda water, wet and dry steamed, and on arrival at the other end are conveyed mechanically into the clean bottle store. After cooling, they again travel by conveyor right up and into bottle-filling and capping machines.

The electrical circuits—both for lighting and power—are wired exclusively with "St Helens" C.T.S. cable run not only on the surface, but embedded in concrete walls, floors, and ceilings, behind tiles, and under cement floors and yards, and on the surface in outside situations exposed to the weather, without any other protection than that afforded by the hard rubber sheathing. We understand that the system has proved itself absolutely immune from all the evils of excessive heat and cold, hot and cold water, steam, condensation, and weather. These conditions exist night and day, floors are always wet, walls and ceilings constantly damp or dripping with water. The power plant consists of 17 motors ranging from ½ to 30 h.p. Lighting is very effective and economical. All switches, fuseboards, and other gear are "ironclad," and these and all motors and fittings are very carefully earthed. Wires and cables enter through bushed holes filled in with bitumen. Both lighting and power installations have been neatly carried out, and form a fine example of a C.T.S. job. The installations were designed and carried out by Mr. Walter White, A.M.I.E.E.

**A Turbine Installation in Norway**—According to *Swedish Export*, at the Raanaasfos water power station on the River Glommen, Norway, the plant is to develop 51,000 h.p. with four turbines running, and a water supply of 340 m³/sec. at 13.2 m. head. This amount of power can be obtained at 11 m. head if five turbines are used. When the flow is greater than 1,000 m³/sec., and the head correspondingly lowered, it will require six turbines to attain the power in question, but as these periods are very short, no spare turbine is necessary for these periods, and therefore only six turbines have been installed. Twin horizontal turbines of 12,000 h.p. and 107 revs. per min. at 12.25 m. net head were selected. This arrangement was the cheapest, and had also the advantage of making the power house shorter. The Raanaasfos turbines are said to be the largest turbines of this type in the world. Three of the turbines were ordered from Verkstaden, Kristinehamn, Sweden, and three from J. M. Voith, of Heidenheim. The highest guaranteed efficiency was 85 per cent. at about 10,500 h.p. The efficiency tests were conducted in accordance with a very elaborate programme. For the Kristinehamn turbines the highest efficiency observed was 89.9 per cent. at 11,650 h.p. The curve indicates a highest efficiency at 11,360 h.p., amounting to 90.1 per cent. The test of the Voith turbines showed a best efficiency at 10,400 h.p. of 85 per cent.

**Appointments Vacant.**—Engineer to take charge of design at H.M.S. *Vernon*, Portsmouth (£300 + bonus); Richmond (Yorks.) Borough Council requires an electrical engineer to advise as to lighting scheme; two demonstrators (electrical engineering and physics), £250 + bonus, for the Royal Naval College, Keyham, Plymouth. (See our advertisement page to-day.)

**The Luxostat.**—In the course of a lecture delivered in Toronto, Dr. W. J. Harvey, of the Royal College of Science, demonstrated the "Luxostat," which consists of a large number of mirrors so placed that the reflected light from each mirror can be directed on a given spot, thus increasing the temperature of the object upon which the rays are concentrated. According to the *Transactions* of the Illuminating Engineering Society, Dr. Harvey has been able to do soldering in this manner, the particular advantage of the method being that there is no oxidation.

**Injury from Radium Emanation.**—According to a report of the United States Public Health Service, exposure to radium emanation for a few hours daily is dangerous to health; the blood is especially affected, showing a reduction in the numbers of both the red and the white corpuscles, and the blood pressure becomes abnormally low. Probably the highly penetrative gamma rays of radium affect the bone marrow, which is the source of the blood cells. It is recommended that workers in radium be protected as far as possible by the use of metal screens opaque to the rays, and be subjected to frequent physical examination.—*Science Service.*

## Institution Notes.

**Institution of Electrical Engineers.**—NORTH-EASTERN CENTRE.—The annual dinner of the North-Eastern Centre was held in Newcastle-on-Tyne on the 12th inst., Mr. T. Carter, chairman, presiding over a gathering of 110 members and guests. The Lord Mayor of Newcastle was present, as was also Dr. Alex. Russell, president of the Institution. After the loyal toast, Dr. Thornton proposed "The Lord Mayor and Corporation"; in his reply the Lord Mayor (Mr. Stephen Easten) said that unemployment was sapping the standing of the country, and urged that it was much better to pay more money for productive work than to have recourse to the demoralising plan of relief works.

Sir Theodore Morison (principal of Armstrong College) proposed the toast of "The Institution," and said that at Armstrong College, where they were contemplating considerable developments in the engineering department, they would need the sympathy, co-operation, and support of electrical engineers. —Dr. Russell, in his reply, referred to the part the Institution was taking in the forthcoming exhibition in London. Mr. H. W. Clothier proposed "Our Guests," and Mr. H. Shaw responded.

SPECIAL MEETING.—A special general meeting of the corporate members of the Institution will be held in the Lecture Theatre on February 28th at 5.30 p.m., pursuant to Clause 17 of the Charter of the Institution for the purpose of considering, and if thought fit, passing a resolution in order to amend by-law 9 so that every Member and Associate Member may be entitled to describe himself as a "chartered electrical engineer." In using that description after his name, it should be placed after the designation of the class to which he belongs, but when practising under the title of, or as an officer or employe

of, a limited company or in partnership with any person who is not a member or associate member of the Institution under the title of a firm, it is not permitted to describe such company or firm in any way as "chartered electrical engineers."

KELVIN MEDAL.—The second triennial award of the Kelvin Medal has been made by the Award Committee to Professor Elihu Thomson, who is an honorary member of the Institution.

ASSOCIATE MEMBERSHIP EXAMINATION.—The next examination will be held on April 3rd, 4th, and 5th, 1924. The examination is being held this year about a fortnight earlier than in past years in order that those successful candidates who have qualified in other respects for associate membership may be elected before the end of the session.

SMOKING CONCERT.—The fifth annual smoking concert of the Informal Meetings Section will be held at the Engineers' Club, Coventry Street, London, on Monday next, February 25th, at 7.30 p.m. Col. T. F. Purves, O.B.E., R.E., will be in the chair. The programme has been arranged by Mr. J. F. Avila.

MERSEY AND N. WALES (LIVERPOOL) CENTRE.—The dinner of the Centre, postponed from January 25th, will be held on Friday, March 7th.

**Institute of Transport.**—ANNUAL DINNER.—The fifth annual dinner of the Institute was held on the 14th inst. The president, Sir J. G. Broodbank, referred to the fact that Mr. H. Gosling, Minister of Transport, found himself faced in his new office with the urgent problem of traffic in London. He wondered whether the Minister's unique experience in association with the watermen and lightermen would enable him to bring the river to aid him in its solution. The Institute of Transport had two provincial sections, *viz.*, at Manchester and Birmingham, and three others were in course of formation. This year's congress would be held at Bristol.

**Institution of Railway Signal Engineers.**—ANNUAL MEETING.—At the annual general meeting of the Institution on February 13th, Mr. W. J. Thorrowgood, M.I.E.E., signal and telegraph superintendent of the Southern Railway, was elected president for the current year. Mr. Thorrowgood is to report on signals to the London meeting of the International Railway Congress next year.

**Institute of Metals.**—ANNUAL MEETING.—The annual general meeting of the Institute will be held at the Institution of Mechanical Engineers on March 12th and 13th, 1924. A selection of papers will be presented and discussed, amongst which the following are expected to be submitted:—W. E. Alkins, M.Sc., "The Relation Between the Tensile Strength and the Electrical Resistivity of Commercially Pure Copper." E. R. Jette, G. Phragmén, and A. F. Westgreen, Ph.D., "X-ray Studies on the Copper-Aluminium Alloys." Stuart H. J. Wilson, B.Sc. (N.Z.), M.Sc. (Vic.), "Note on the Effect of Cold-drawing and Annealing on Some Electro-Chemical Properties of a Low-Tin Bronze." After the annual meeting the next gathering will take place on June 4th, at the Institution of Mechanical Engineers, in connection with the Empire Mining and Metallurgical Congress, when Dr. F. W. Aston, F.R.S., will deliver the annual May lecture, his subject being "Atoms and Isotopes." The autumn meeting will be held in London from September 8th to 11th. The annual dinner will be held at the Trocadero Restaurant on March 12th.

**Tramways and Light Railways Association.**—CONGRESS.—The 1924 Congress of the Association is to be held on July 3rd and 4th at Edinburgh.

## Our Personal Column.

*The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.*

MR. J. E. PEARCE, M.C., an engineer at the Hammersmith electricity undertaking, has been gazetted lieutenant in the 11th (London) A.A. Battalion, R.E.

SIR P. LLOYD-GREAME, late President of the Board of Trade, has rejoined the board of the Anglo-Argentine Tramways Co., in place of Mr. J. Heaton, who has resigned owing to ill-health.

DR. ROBERT KNOX, director of the Electrical and Radio-Therapeutical Dept. of the Cancer Hospital, London, is one of the nine members of the scientific advisory committee that has been formed in connection with the British Empire campaign to fight cancer.

MR. E. A. MARX retired from the board of the Z Electric Lamp & Supplies Co., Ltd., as from November last, when his official connection with the business ceased.

At the staff dinner of the Ilford Urban District Council Electricity Dept., held at the Cauliflower Hotel, High Road, Ilford, on Thursday evening last week, Mr. G. F. Gregory, on behalf of the staff, presented Mr. A. H. SHAW, M.I.E.E., with a gold mounted walking stick as a token of their good wishes.

It is announced that Sir GEORGE SUTTON, Sir T. O. CALLENDER, Mr. DANIEL SINCLAIR, Mr. FRANCIS HIRD, and Mr. ALBERT EDGAR TANNER have joined the board of the Enfield Cable Works, Ltd.

DR. ELIHU THOMSON, who has been awarded the Kelvin Gold Medal instituted in 1914 by British and American engineers, is a Briton by birth, but arrived in the United States at the age of five years, and was brought up in Philadelphia. According to the *Electrical World* he was professor of chemistry and mechanics at the Central High School until, in 1880, he became head of the American Electric Company, subsequently reorganised and renamed the Thomson-Houston Electric Company. In 1892 the business was amalgamated with that of the Edison General Electric Co., under the title of the General Electric Co., and Dr. Thomson was retained as consultant, a position which he still holds. He has taken out 700 patents in the United States, and has worked in almost every field of electrical activity; he has served as president of the American I.E.E., and of the International Electro-technical Commission, and was the first recipient of the Edison Medal.

MR. VINCENT DE FERRANTI, the son of Dr. S. Z. de Ferranti, has been made a director of the firm of Ferranti, Limited.

**Obituary.**—MR. F. C. CRAWFORD.—It is with great regret that we have to record the death, in his sixty-first year, of Mr. Frank Cornwall Crawford, A.I.E.E., submarine cable engineer, who died of pneumonia on the 8th inst., on board ship on the way to Las Palmas, whither he was bound in connection with the projected Italian cables, as representative of Messrs. Clark, Forde & Taylor, telegraph engineers. Mr. Frank Crawford was the son of Mr. Dalrymple Crawford, and was born in Canada, where his father had acquired property on Lake Erie. He was educated at Trinity College, Stratford-on-Avon (his father's English home) and at King's College, London. After serving in the shops of the Great Western Locomotive Works at Wolverhampton, he was engaged in survey work on the Baltimore and Ohio railway, and joined the submarine cable staff of the Silvertown Co. in 1885. In the capacity of assistant engineer he went on cable-laying expeditions on the West Coast of Africa, the

THE LATE MR. F. C. CRAWFORD.

Gulf of Mexico, and on the East and West Coasts of South America. Later, as engineer-in-charge, he laid cables for the Dutch Government off the coast of Holland, for the Turkish Government in the Ægean Sea, and for the Pacific Cable Board between Australia and New Zealand. But the most important work for which he was responsible occurred during the Great War, in the year 1915, when, on the Silvertown Co.'s cable-ship *Dacia*, on behalf of the French Government, he cut the German Emden-Teneriffe cable off the coast of France, and ran the northern end into Brest. He then cut the same cable off Teneriffe, picked up northward some 500 knots in a depth of from 2,000 to 3,000 fathoms, and then relaid the cable into the French Colonial port of Casablanca in Morocco. This was the first time that a cable of such length had been recovered in these depths in a condition fit for immediate relay, and the project had been declared impracticable by several prominent English and French cable engineers. Mr. Crawford deserved the credit of successfully carrying through the work in spite of their adverse reports. In 1913 Mr. Crawford married Miss Mary Kater, of Sydney, Australia, and had been spending the winter in Switzerland with his wife. Few engineers have been so deservedly popular with both the staff and the hands, and he will be greatly missed by a large circle of friends and acquaintances.

MR. C. H. CATHCART.—The death occurred suddenly, on February 2nd, at his residence, Branksome, Cressingham Grove, Sutton, Surrey, of Mr. Charles Henry Cathcart, electrical engineer. The deceased, who was 62 years of age, was at one time associated with Mr. Peto in the invention and manufacture of storage batteries.

The wife of Mr. W. WYLD, M.I.E.E., of the Vickers-Spearing Boiler Co., Ltd., passed away after a very short illness on February 13th, and the remains were cremated at Golder's Green on Saturday last.

**Wills.**—The late J. S. HORNER, managing director of John Birch & Co., engineers, left £32,545.

The late Rt. Hon. LAURENCE WALDRON, P.C., D.L., chairman of the Dublin United (Electric) Tramways Co., left estate valued at £55,551.

## New Companies Registered.

**Diamond Wireless, Ltd.** (195,559).—Private company. Registered February 6th. Capital, £3,000 in £1 shares. To carry on the business of manufacturers of and dealers in all kinds of wireless and electrical apparatus, &c. The subscribers (each with one share) are:—W. Jones, 184a, Oxford Street, W.1, electrical engineer; J. C. Helme, 184a, Oxford Street, W.1, certified accountant. W. Jones is one of the first directors, and shall be permanent. Registered office: 184a, Oxford Street, W.1.

**Cleveland Electrical Engineering Co., Ltd.** (195,576).—Private company. Registered February 7th. Capital, £500 in £1 shares. To carry on the business of electrical engineers, manufacturers, importers and exporters of and dealers in all kinds of electrical apparatus for lighting, heating, ventilating and power, and all classes of telephonic, signalling, and wireless apparatus, &c. The first directors are:—W. R. Davidson, 69, Lumley Road, Redcar, engineer; F. Jervis, 71, Cornwall Street, West Hartlepool, engineer. Qualification, £50 shares. Remuneration as fixed by the company. Secretary: J. A. O'Brien. Registered office: 34, Newcomen Street, Redcar, Yorks.

**H. Jacobi & Co., Ltd.** (195,648).—Private company. Registered February 11th. Capital, £500 in £1 shares. To carry on the business of manufacturers of and dealers in electrical and wireless plant, machinery, apparatus, accessories and equipment, &c. The subscribers (each with one share) are:—C. Wybrow, 100, Denmark Road, Myatts Park, S.E.5, solicitor's clerk; H. W. Clayton, 47, Vespan Road, W.12, solicitor's clerk. The first directors are not named. Registered office: 25, Oxford Street, W.1.

## Official Returns of Electrical Companies.

**Defiance Electrical Co., Ltd.**—Particulars filed of £2,000 debentures authorised January 14th, 1924, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

**Altrincham Electric Supply, Ltd.**—Debenture charged on the company's undertaking and property, present and future, including uncalled and unpaid capital, dated January 30th, 1924, to secure £18,000. Holders: Westminster Bank, Ltd.

**Marrec, Ltd.**—Mortgage on certain freehold land in Eastern Road, Burnham-on-Crouch, with dwelling house erected thereon, dated February 4th, 1924, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

**Hamilton Wells Electric Medical Institute, Ltd.**—Debenture dated January 23rd, 1924, to secure £500, charged on the company's property, present and future, including uncalled capital. Holder: W. L. Highway, 10a, Temple Row, Birmingham.

**Burndept, Ltd.**—Charge on the freehold and leasehold properties at Blackheath and the company's other assets, including uncalled capital dated February 4th, 1924, to secure all moneys due or to become due from the company to Coutts & Co., 440, Strand, W.C., not exceeding £25,000.

**G. L. Adamson, Ltd.**—Mortgage on 116, Yorkshire Street, Rochdale (freehold) dated January 30th, 1924, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

**Newcastle-upon-Tyne Electric Supply Co., Ltd.**—Acknowledgment of further indebtedness dated January 22nd, 1924 (supplemental to trust deed dated October 16th, 1913), to secure a further £26,000 6 per cent. second mortgage debenture stock, ranking *pari passu* with £1,250,000 like debenture stock secured by the said trust deed and two acknowledgments of indebtedness dated November 10th, 1914, and December 10th, 1921. Property charged (specifically): The electric lighting and power undertaking and freehold and leasehold premises specifically charged by the trust deed and the shares in the Carville Site and Power Co., Ltd., charged by the registered charge dated March 4th, 1915 (as a floating security); the company's undertaking and other assets, except uncalled capital (without power to the company to create any mortgage or charge thereon ranking in priority to or *pari passu* with the stock). Trustees for debenture stock holders: Law Debenture Corporation, Ltd., 24, Old Broad Street, E.C.

**Cutting Brothers, Ltd.** (81,178).—Return dated December 28th, 1923. Capital, £40,000 in 3,000 ordinary and 1,000 preference shares of £10 each. 1,877 ordinary and 522 preference shares taken up. £10 per share called up on 1,477 ordinary and 522 preference and £2 per share on 400 ordinary. £20,720 paid. £3,260 considered as paid on 400 shares. Mortgages and charges, £26,500.

**Ferranti, Ltd.**—Registered February 27th, 1905. Capital, £900,000 in £1 shares (100,000 6 per cent. preference, 100,000 7 per cent. second preference, and 100,000 ordinary). Return dated November 1st, 1923. 71,166 6 per cent. preference 75,000 7 per cent. second preference, and 60,000 ordinary shares taken up. £206,166 considered as paid. Mortgages and charges, £54,020.

**Davies, Kent & Stewart, Ltd.** (81,627).—Capital, £3,500 in 2,500 preference and 1,000 ordinary shares of £1 each. Return dated December 28th, 1923. 1,974 preference and 1,000 ordinary shares taken up. £2,974 considered as paid. Mortgages and charges, £1,030.

**Hackbridge Electric Construction Co., Ltd.**—Satisfaction in full on January 16th, 1924, of mortgage dated May 25th, 1922, secured £10,000.

**East India Tramways Co., Ltd.** (74,457).—Capital £100,000 in 15,000 preference, 35,000 ordinary, and 50,000 deferred shares, of £1 each. Return dated December 5th, 1923. 7,476 preference, 33,433 ordinary, and 50,000 deferred taken up. £7,476 paid on 7,476 preference (also paid on 24 preference forfeited, not included in total of 7,476), and £7 paid on 7 ordinary. £83,426 considered as paid on 33,426 ordinary and 50,000 deferred. Mortgages and charges, nil.

**Birkdale District Electric Supply Co., Ltd.** (70,259).—Return dated June 28th (filed December 11th), 1923. Capital, £50,000 in £1 shares. 9,200 shares taken up. £46,000 paid. Mortgages and charges, £0, issued to bankers as collateral security.

## City Notes.

**North Metropolitan Electric Power Supply Co.**

The directors' report, which was presented at the annual meeting on Tuesday last, states that the net revenue for the year was £223,435, as compared with £172,845 in 1922. To this was added £7,07[illegible] brought forward, making £230,509. From this were deducted mortgage, debenture stock, and other interest, £31,298; contribution to reserve fund for 5 per cent. mortgages, £2,000; and contribution to the reserve account £100,000; leaving £97,211. It was proposed to deal with this as follows:—Dividend on 6 per cent. cumulative preference shares, £35,999; dividend on 8 per cent. cumulative second preference stock, £20,000; dividend of 10 per cent. on the ordinary shares, £35,002; carrying forward £6,210. The capital expenditure during the year in respect of generating plant and machinery, trunk and distributing mains, and new sub-stations was £237,719. Approximately 86 miles of underground mains and 12 miles of overhead lines were installed during the year, and 14 new sub-stations were put into service. Additional generating plant, amounting to 10,000 kW, was installed. The energy sold increased from 65,100,00[illegible] to 78,500,000 kWh. New undertakings were established at Friern Barnet, Harpenden, Hoddesdon and Broxbourne, and Hatfield and Chingford. An issue of £350,000 5½ per cent. debenture stock was made in April, 1923, and was largely over-subscribed. Out of the proceeds of this issue was redeemed the £226,180 7½ per cent. debenture stock which was outstanding. A Bill has been deposited in the present session of Parliament to enlarge the company's area of supply, to increase the authorised capital to £2,000,000, to extend the borrowing powers, and for other purposes. Sir James Devonshire, K.B.E., has been elected chairman and managing director in the place of Mr. E. Garcke who, however, remains a director. Mr. E. R. Soames has taken the place of Mr. W. L. Madgen on the board.

**Notting Hill Electric Lighting Co., Ltd.**

The report presented at the annual meeting on Tuesday last stated that the available profit for the year, including £15,13[illegible] brought forward, amounted to £80,62[illegible] From this were deducted; Contribution to depreciation, renewal, and reserve fund, £6,000; special reserve, £3,000; first mortgage debenture and seven-year note interest, £3,334; debenture interest (less tax), £2,269; interest on loans, £1,455; reserve for contingencies and replacements £1,107; sinking funds, £1,709; and income tax, £7,642; leaving available a balance of £45,402. It was proposed to allocate this in the following manner: Distribution to staff under co-partnership scheme, £1,394; final dividend on 6 per cent. preference shares (less tax), £3,348; sinking fund in respect of 7½ per cent. seven-year notes, £3,210; final dividend on the deferred shares at the rate of 10 per cent., free of tax, £13,[illegible] leaving £23,925 to be carried forward. The cost of the joint station at Wood Lane to date has amounted to £301,820, and joint debenture stock, amounting to £193,244, is outstanding. In addition, £25,000 second debenture stock was issued as collateral security for loans, but arrangements had been made for its cancellation in January. The sinking funds now amount to £134,145, the bulk of which consists of trustee stocks maturing for payment on about the date when the first debenture stock falls due in 1931. The connected load increased during 1923 from 11,474 to 12,392 kW, and the sales amounted to 4,815,273 kWh. A further reduction in the charge for lighting energy—from 7d. to 6d. per kWh—is to be made on April 1st.

**Liverpool Overhead Railway Co.**

The receipts from passenger traffic during 1923 amounted to £130,103, and miscellaneous receipts to £3,823, making £133,926. Working expenses totalled £116,727, and £5,000 was contributed to the renewal fund, and £400 to the contingent fund, leaving a surplus of £11,798. From this was deducted debenture interest amounting to £6,755. To the balance was added £3,000—proportion of amount receivable under the Railways Act, 1921, and £5,577 brought forward, making a total of £13,620 available. This is allocated as follows:—Dividends on preference shares (5 per cent. for the year), £7,931; carried forward, £5,689. The number of passengers carried increased from 11,719,762 to 11,865,732. The annual meeting was held yesterday (Thursday).

**Cambridge Electric Supply Co., Ltd.**

The accounts for the year 1923 show a total profit of £25,926. From this £10,000 is transferred to the depreciation fund, and £5,000 brought forward is also placed to the credit of this fund; a dividend of per cent. for the year was recommended, absorbing £7,000; d a balance of £6,271 is carried forward. During the year 1,500-kW turbo-alternator was installed. A new boiler s been purchased, a new switchboard erected, and the ins have been extended in several districts. The meeting as held on Wednesday last.

**The "Underground" Group.**

We give below a brief summary of the reports of the railway companies constituting the "Underground" group.

*Central London Railway Co.*—The traffic receipts at £573,006 and the expenditure £372,927 were over £40,000 less in each case than the figures r 1922. The total net income was £280,268—an increase of 8,576. To this was added a balance of £74,412 brought forrd, giving an available total of £354,680. From this were educted:—Interest, rentals, and other fixed charges, £69,351; ppropriation to reserve for contingencies and renewals, 0,000; and the dividend on preference stock, £21,600; aving £214,729. After the payment of final dividends (*vide* ngr. Rev., February 15th, p. 267) a balance of £94,729 remained to be carried forward. The capital expenditure during the year amounted to £87,878.

*Metropolitan District Railway Co.*—There was a reduction £36,446 in the traffic receipts, making them £1,717,719, hile the expenditure only declined by £1,566 to £1,217,260. he total net income amounted to £721,889—a reduction of 3,330. With £77,075 brought in, there was a total of 798,964, from which were deducted:—Interest, rentals, &c., 38,221; reserve for contingencies and renewals, £65,000; nd dividend on guaranteed and preference stocks, £198,430; aving £197,313. After the payment of the final dividends a alance of £84,088 is carried forward. A total of £110,327 was ent on capital account.

*London Electric Railway Co.*—The traffic receipts at 1,873,158 were lower by £104,441, while the expenditure ll by £67,790 to £1,069,805. The net income was £970,209—decline of £8,459. A balance of £73,842 was brought forrd, and from the total of £1,044,051 the following sums ere deducted:—Interest, rentals, &c., £312,450; appropriaon to reserve for equalising the charge in respect of interest n the 4½ per cent. redeemable second debenture stock, 5,000; and dividend on preference stock, £126,947; leaving 84,654. The payment of final dividends left a balance of 111,537 to be carried forward. The capital expenditure uring the year was £1,115,406.

*City and South London Railway Co.*—The traffic receipts uring the year totalled £300,822, a fall of £108,395. The exenditure fell by £95,633 to £116,812. The total net income 213,771 was £11,056 lower. A balance of £27,864 was rought forward, and from the total of £241,635 the followng allocations were made:—Interest, rentals, &c., £47,652; ontingencies and renewals reserve, £36,000; reserve for qualising the charge in respect of interest on the 4½ per ent. redeemable second debenture stock, £27,500; and preference dividend, £42,500; leaving a balance of £87,983. 7,864 is carried forward after the payment of final dividends. he capital account shows an expenditure of £1,211,463.

*Summary of results.*—The following is a comparative statement of the results of the four railway companies and the London General Omnibus Co., Ltd.:—

| | 1923. £ | Increase + Decrease − £ |
|---|---|---|
| Traffic receipts | 12,120,118 | −158,208 |
| Expenditure | 9,922,386 | − 20,642 |
| Net receipts | 2,197,732 | −137,566 |
| Miscellaneous receipts (net) | 793,913 | +152,335 |
| Total net income | 2,991,645 | + 14,769 |
| Deduct— | | |
| Interest, rentals, and fixed charges | 947,686 | + 82,582 |
| Appropriation to reserve for contingencies and renewals | 350,000 | − 75,000 |
| Appropriation for equalising the charge in respect of interest on the 4½ per cent. redeemable second debenture stocks | 92,500 | − |
| Dividends on guaranteed and preference stocks | 389,477 | — |
| Total deductions | 2,009,663 | + 7,582 |
| Balance | *981,982 | + 7,187 |
| Add balances from last year's accounts | 324,955 | + 71,813 |
| Total amount available for dividends on ordinary stocks and shares and for other purposes | 1,306,937 | + 79,000 |
| Amount paid in dividends on ordinary stocks and shares representing an average rate of 4.80 per cent. in 1923 and 4.60 per cent. in 1922 | 923,159 | + 20,177 |
| Balances carried forward to next year's accounts | 383,778 | + 58,823 |

*After the operation of the common fund, reserves were increased by £20,000, which explains the difference between the balance of £981,982, shown above, and the amount of the common fund, which is given as £1,000,982, as compared with £1,029,795.

The traffic statistics (including omnibuses) show a net increase, although workmen's and season tickets again showed decline. The figures are as follows:—

| Passengers carried. | 1922. | Inc. or dec. |
|---|---|---|
| Ordinary | 1,246,591,207 | +179,934,420 |
| Workmen | 48,524,871 | − 2,180,598 |
| Season | 50,361,460 | − 4,204,050 |
| Total | 1,345,477,538 | +173,549,772 |
| Number of car-miles run | 187,169,596 | + 23,767,994 |

The annual meetings of the companies were held yesterday (Thursday).

**St. James' and Pall Mall Electric Light Co., Ltd.**

The statement of accounts shows that the net profits for 1923 amounted to £42,399, and the addition of £15,916 from the last account makes an available balance of £58,315. An interim dividend at the rate of 7 per cent. on the preference shares took £3,500, and an interim dividend at the rate of 10 per cent. on the ordinary shares took £10,000, leaving £44,815. It is proposed to allocate this as follows:—Final dividend at the rate of 7 per cent. on the preference shares, £3,500; final dividend of 7s. 6d. per share and a bonus of 5s. on the ordinary shares, making 17½ per cent. for the year, £25,000; and to carry forward £16,315. The Bill referred to in the last report, which was lodged by the London Electricity Joint Committee (1920), Ltd., in the session 1923, was withdrawn, and the Committee Company has lodged a Bill in the present session—the London Electricity Supply (No. 2) Bill—which it is believed gives effect to certain resolutions passed by the London County Council in July last. The connections of the company increased from 21,324 to 22,721 kW, and the sales of energy amounted to 18,168,210 kWh. The Central Electric Supply Co., Ltd., is paying a dividend of 5 per cent. on its ordinary shares; the St. James' company receives £2,500 less tax from this source. The meeting is to be held on February 26th; it will be followed by an extraordinary meeting to approve the above-mentioned Parliamentary Bill.

**Power Securities Corporation, Ltd.**

The first annual meeting was held on February 5th. Mr. George Balfour, who presided, pointed out that the accounts covered a period of 15 months, although the earlier months were necessarily occupied with the preliminaries of formation. The company was formed to deal with every aspect of public utility undertakings—concession rights, finance, engineering, construction, and operation. The original capital was £1,000,000 in 400,000 ordinary shares and 500,000 7 per cent. participating preference shares of £1 each, issued at par, and 100,000 ordinary shares of £1 each issued at 22s. The capital of Messrs. Balfour Beatty & Co. had been acquired, and the Corporation thus started with an experienced staff and a considerable amount of business. The investments stood at £706,391, and of this about 36 per cent. was invested in sound electrical undertakings. The item of "Loans and participations," amounting to £132,509, included, to the extent of 73 per cent., advances to electrical undertakings, the balance being connected with important electrical developments in this country. A gross trading profit of £85,535 accrued during the period under review, and a balance of £65,233 was available for dividends and reserves. It was decided to pay a dividend at the rate of 6 per cent. on the ordinary shares, less tax.

**County of London Electric Supply Co., Ltd.**

An extra-ordinary general meeting was held on February 12th to consider and approve two Bills which are being promoted in the present session of Parliament—the London Electricity Supply (No. 1) Bill and the County of London Electric Supply Company Bill. Sir Harry Renwick, K.B.E. (chairman), who presided, explained the provisions of these measures. The first Bill provided for the extension of tenure and the amalgamation of the London companies, subject to satisfactory price safeguards, and the transfer of their undertakings to a Joint Electricity Authority in 1971. The company's own Bill would, if passed, confer further powers upon the company with reference to the supply of electricity in the county of Essex and for other purposes. Resolutions approving both Bills were agreed to.

**Tyneside Tramways and Tramroads Co.**

The annual meeting was held in Newcastle-on-Tyne on February 12th. Mr. G. E. Henderson, who presided, said that the traffic receipts showed a decrease for the year of £3,494. The working expenses showed a decrease, but this was not equal to the drop in traffic receipts. The result was that the gross profit was £1,738 less than in 1922. Taking all the circumstances into account, the directors did not feel justified in recommending any dividend on the ordinary shares, but would rather congratulate the shareholders on the fact that, notwithstanding the very severe depression on Tyneside during the past year, the company had not only been able to pay its way, but also to make a small profit. He drew attention to the cost of the maintenance of the permanent way. Tramway undertakings were responsible for the upkeep of the roads for the width of their lines and 18 inches beyond the outer rail, and the cost of maintenance of roads had been very much increased during past years by the large amount of heavy mechanical traffic. While these mechanical vehicles were paying towards the upkeep of the roads, in the shape of motor taxation, the Government so far had not seen fit to make any grant from this fund to tramway undertakings for road maintenance purposes. Thus, in many cases, tramway undertakings were having to bear the burden of largely increased cost of maintenance of their track, and also competition by omnibuses, which used the track which the tramway undertakings had to maintain.

**Torquay Tramways Co., Ltd.**

The directors' report for 1923 shows a profit of £31,283, to which is added interest on investments, &c., making £34,972. After deducting debenture interest and a contribution to the sinking fund for prior lien debentures there remains a balance of £28,372, which, together with £2,212 brought forward, gives an available balance of £30,584. It is proposed to distribute this as follows:—Reserve and renewals account, £13,000 (bringing this up to £82,000); reserve for equalisation of dividends, £1,000; income tax provision, £3,000; depreciation on furniture, &c., £140; final dividend of 4 per cent. and bonus of 1 per cent. (free of tax), making 9 per cent. for the year, £2,644, carrying forward £2,644. The revenue and profit both show a large increase over those of 1922. The motor-'bus services of the Devon General Omnibus and Touring Co., Ltd., produced satisfactory results. Two new 76-passenger cars have been ordered; if these are successful the whole of the cars on the Torquay-Paignton route will be replaced by this type. Agreement has practically been reached for a lease of the Babbacombe Cliff Light Railway. The meeting was held yesterday.

**Clyde Valley Electrical Power Co.**

The directors' report for 1923 states that the balance of profit amounted to £205,897, which, together with the balance brought in, made a total of £239,240. After the payment for the first half-year of the 6 per cent. cumulative preference dividend, £9,000; year's dividend on the 8 per cent. second preference shares, £40,000; an interim dividend of 3 per cent. on the ordinary shares, £18,000; and transferring £70,000 to the contingency fund, and £24,191 to the second preference share special reserve fund (making this £30,000), there remains a balance of £78,049. It is proposed to allocate this as follows:—Second half-year's dividend on the 6 per cent. preference shares, £9,000; final dividend of 5 per cent. on the ordinary shares (making 8 per cent. for the year), £30,000; to write off the balance of the cost of the second preference share issue and loan capital duty, £9,941; leaving £29,108 to carry forward to the next account. Reference is made in the report to the reorganisation of electricity supply in the West of Scotland and to the inquiry which is to be held by the Electricity Commissioners in March. The company has made application for a Provisional Order to authorise it to raise additional capital, to extend the area of supply, and for other purposes. Meeting: Glasgow, February 26th.

**London Electric Supply Corporation, Ltd.**

The directors' report for the year ended December 31st last, which is to be presented at to-day's meeting, states that the profit on working amounted to £154,452, as compared with £150,199 in 1922. To this is added a balance brought forward, less interest on temporary loan and expenses in connection with the issue of new ordinary shares, making £173,557. From this have been deducted interest on the debenture stock, £23,494, and contribution to debenture-redemption sinking fund, £16,580, leaving a balance of £133,483. It is proposed to deal with this as follows:—Dividend of 6 per cent. on the preference shares (3 per cent. already paid), £26,952; dividend of 10 per cent. on the ordinary shares (Nos. 1 to 111,000), £33,000; to reserve, £15,000; to depreciation, £20,000; to contingencies, £5,000; carrying forward, £33,231. The sales of energy rose from 49,675,886 kWh in 1922 to 52,819,491 kWh, but owing to the reduction in prices the average receipts per kWh sold fell from 1.74d. to 1.69d. Reference is made in the report to the London Electricity Supply (No. 2) Bill. An extraordinary general meeting was to have been held after the main meeting to approve this Bill; to approve the division of the ordinary shares into three shares of £1 each; and to alter No. 78 of the Articles of Association to provide that a holder of ordinary shares shall have one vote for every £3 in nominal value of the shares held by him.

**Metropolitan Railway Co.**

The report of the directors for the year 1923, presented at yesterday's annual meeting, showed that the gross traffic receipts, &c., amounted to £1,881,447, and miscellaneous receipts (rents, interest, &c.) to £287,988. The expenditure was £1,289,996, and the net income was thus £879,439. The addition of £33,137 from the previous account made available a total of £912,576. From this were deducted interest, rentals, and other fixed charges, and appropriation to general reserve fund, amounting in all to £310,607, and dividends on preference stock, £269,098. The balance was distributed as follows:—Interim dividend on the ordinary stock at the rate of 3 per cent. for the half-year ended June 30th, £111,608; dividend at the rate of 5 per cent. for the second half-year (making 4 per cent. for the year, as against 3½ per cent. in 1922), £186,013; and the balance (£35,250) was carried forward. The amount contributed to reserve was £15,000 as in 1922; the carry-forward is slightly higher. In common with other railway companies, the company reduced its passenger and goods rates during the year, but the loss of revenue thus sustained was more than counterbalanced by the reduced expenditure and the increased receipts from other sources of revenue. The construction of the extension to Watford made substantial progress during the year; a contract for the erection of the new station at Watford was placed. Steps are being taken to extend the electrification of the railway beyond Harrow to Rickmansworth and Watford in order that a through electric train service between London and those towns may be inaugurated as soon as the new line is completed. A diversion of the Uxbridge line junction near Harrow and the re-signalling of the line as far as Rickmansworth has been commenced with a view to improving the working of the train services on the extension lines. Other works either in progress or in contemplation include the erection of a sub-station at Willesden Green, the reconstruction of St. John's Wood Road and Willesden Green stations, the enlargement of the Wembley Park goods yard, and the provision of an additional junction between the Inner Circle and the widened lines near King's Cross. The reconstruction of the Farringdon and High Holborn stations is practically complete. A resolution was to have been put forward at an extraordinary meeting yesterday sanctioning the raising of the money authorised by the Metropolitan Railway (Various Powers) Act, 1923.

**Rushden and District Electric Supply Co., Ltd.**

The annual meeting was held on Friday last, Mr. F. H. Thornton (chairman) presiding. The chairman said that the output of the station had reached its limit during the year under review, and the company could not extend its supply until it was supplied in bulk by the Northampton Electric Light & Power Co., Ltd. The capital expenditure during the year amounted to £8,577, of which £4,344 had been spent on machinery, £1,05[illegible] on buildings in connection with a bulk supply from the Northampton company, and £1,957 on mains in the same connection.

**Westminster Electric Supply Corporation, Ltd.**

The balance of the net revenue account, after providing for sinking and reserve funds and other charges, was £161,733 (including £86,163 brought forward). The payment of the interim dividends absorbed £46,378, leaving a balance of £115,355. It is proposed to distribute this as follows:—Final dividend on 4½ per cent. preference shares, £12,375; final dividend of 7s. 6d. per share (making 12 per cent. for the year) on the ordinary shares, £56,671; and a bonus of 3s. per share, amounting to £22,669; leaving £23,640 to be carried forward. The report makes reference to the London Electricity Supply (No. 2) Bill, and after the ordinary meeting on February 27th an extraordinary meeting is to be held to approve this measure.

**Electrical Distribution of Yorkshire, Ltd.**

The net profit for 1923 was £19,233 (as against £14,419 in 1922), and the addition of the amount brought forward, less directors' remuneration, gave an available balance of £22,774 (£17,143). It is proposed to pay a dividend at the rate of 7 per cent. (tax free) on the ordinary shares, £10,500; to transfer £5,000 to reserve; and to carry forward the balance of £7,274. The development made during the past year and now projected necessitates an immediate increase of capital. It is proposed to make an issue of 100,000 shares at a premium of 5s. per shares. These will be allotted proportionately to registered shareholders on conditions which will be made known shortly after the shareholders' meeting on March 4th.

**City of London Electric Lighting Co., Ltd.**

The payment of the following dividends, less income tax at 4s. 7½d. in the £, is recommended:—On the 6 per cent. cumulative preference shares, 7.2d. per share, making 6 per cent. for the year; on the 8 per cent. cumulative second preference shares, 9.6d. per share, making 8 per cent. for the year; on the ordinary shares, 2s. per share, making 15 per cent. for the year. The above distribution will leave about £30,000 to be carried forward, comparing with £30,230 brought forward from 1922.

At an extraordinary meeting held on February 13th, the terms of the London Electricity Supply (No. 1) Bill were approved.

**Mersey Railway Co.**

The report of the directors for 1923, presented at yesterday's meeting, showed receipts of £234,190, and an expenditure of £157,078, leaving a balance of £77,112, to which were added miscellaneous receipts, £9,624, and a balance of £1,798 brought forward, making £88,534. From this were deducted:—Interest, rentals, and other fixed charges, £34,431; appropriation to depreciation and renewal fund, £3,000; interest on contingent debenture stocks, £26,907; and additional appropriation for depreciation and renewals, £3,000; leaving an available balance of £21,196. Out of this it was proposed to pay the full dividend on the 3 per cent. perpetual preference stock, leaving £1,724 to be carried forward.

**Swedish Electrical Company.**

The board of *Allmänna Svenska Elektriska Aktiebolaget*, after writing off Kr. 1,497,000 on buildings and machinery, reports a net profit for the past financial year of Kr. 808,000. Of this amount, Kr. 250,000 is assigned to the tax fund. Kr. 472,000 is employed to cover the loss brought forward, while the remaining Kr. 86,000 is carried forward to new account. The financial situation of the company during 1923 improved considerably, bank deposits showing an increase and liabilities being reduced. All loans against notes of hand and 60 per cent. of mortgage loans have been redeemed to the total amount of Kr. 4,809,000. The board expresses confidence that still better results will be obtained from this year's activity.—*Reuter's Trade Service*, Stockholm, February 14th.

**Prospectus.**—*The Wareham Electric Supply Co., Ltd.* —There is in circulation a prospectus issued by this company offering for sale 3,098 eight per cent. cum. pref. shares of £1 each at par, and 8,475 ordinary shares of 1s. each at 5s. per share. The company's powers are for the supply of electric light to the borough of Wareham (and some importance is attached to the fact that this is situate near Poole, North of Swanage, and West of Bournemouth!). It is estimated that when the plant and mains are working "at the desired capacity," including public lighting (a five years' contract), "and meter rents," the revenue will be in excess of the amount required to pay the preference dividend. Additional plant is being installed and "new consumers are being added." A scheme of amalgamation is under consideration, and if this materialises, it is suggested, the ordinary shares will have rights to participation in the surplus net profits (the balance is put down at 85 per cent., whatever that may mean); this is probably why 5s. is the issue price per 1s. share! The offer is being made by "The Electricity Finance and Distribution Corporation, Ltd." It is hardly likely that any reader of the ELECTRICAL REVIEW will desire to subscribe for shares without having before him a good deal more information than is given in this prospectus. Particulars of the size of plant, the cost of the works, the number of consumers to date, the business done, revenue earned and in prospect, are required, without which the would-be investor can hardly judge whether the 7 per cent. interest on the £5,000 first mortgage debentures, and the *guaranteed* (by whom?) 8 per cent. dividend on the preference shares (£10,000) can be earned, leaving a justifiable assumption that anything can be paid on the ordinary shares (10,000 of 1s. each) which warrants an issue price of 5s. per share. The population of Wareham is less than 2,000.

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**Northampton Electric Light and Power Co., Ltd.**—Presiding at the annual meeting, on February 15th, the chairman (Mr. F. H. Thornton) said that in spite of the existing industrial depression the sales of energy had increased by 10 per cent., principally due to the growth of the domestic demand. During the year, £88,840 had been spent on capital account, including £27,676 on extensions at the main station at Hardingstone Junction; £55,885 on mains; and £38,643 in connection with the main transmission line to Wellingborough and other districts.

**Stock Exchange Notice.**—Application has been made to the Committee to allow the following to be quoted in the Official List:—

Tata Power Co.—£750,000 7½ per cent. "B" mortgage debenture stock.

**Mather and Platt, Ltd.**—Final dividend of 5 per cent. on the ordinary shares, together with a bonus of 5 per cent., making 15 per cent., tax free, for the year. £50,000 to reserve, leaving to be carried forward £178,383, against £174,953 brought in.

**South London Electric Supply Corporation, Ltd.**—Final dividend of 8 per cent., less tax, on the ordinary shares (making 12 per cent. for the year, against 10 per cent.), and a bonus of 3 per cent., less tax (against 1 per cent.).

**County of London Electric Supply Co., Ltd.**—Final dividend of 8 per cent., less tax, on the ordinary shares (making 12 per cent. for the year, against 10 per cent.)., and a bonus of 3 per cent., less tax. The shares of the July, 1922, issue will rank for dividend and bonus from the due dates of instalments to December 31st.

**Metropolitan Electric Supply Co., Ltd.**—Final dividend at the rate of 14 per cent. (making 10 per cent.), as against 8¼ per cent. for 1922.

**Smithfield Markets Electric Supply Co., Ltd.**—Dividend of 5 per cent., making 8 per cent. for the year.

**Mansfield and District Tramways, Ltd.**—Dividend of 6 per cent. on the ordinary shares (making 9 per cent., less tax, for the year).

**Telegraph Construction and Maintenance Co., Ltd.**—Final dividend of 7½ per cent., free of tax, making 10 per cent. for the year 1923.

**Notting Hill Electric Lighting Co., Ltd.**—Final dividend of 10s. per share, tax free, on the deferred capital.

## Stocks and Shares.

MONDAY EVENING.

WHAT with the dock strike and the tensity of the political situation, it might have been supposed that Stock Exchange markets would present little semblance of vitality, and that public attention would be pre-occupied with matters other than financial. But, as usual, the contrary rules, and in many parts of the House a good deal of trade is going on. The electricity supply dividends and reports serve to keep alive the interest in their own particular section, and by the end of this week most of the big London companies will have announced their 1923 results. The statement that if the Electricity Bill No. 1 is passed, proposals will be formulated for amalgamation of the City of London, County of London, South Metropolitan and South London companies, has had no particular effect upon the shares of the companies concerned.

The question is raised whether the West-end companies are also likely to move towards amalgamation, but in well-informed quarters, the idea is not encouraged. It seems to be thought that the West-end undertakings will prefer to remain on their present lines, with possibly a basis of agreement amongst them, but there will be no formal or comprehensive amalgamation such as is proposed for the City and East-end companies.

The market in electricity supply shares is steady. The position is that in view of the present prosperous condition of the industry, holders of shares are by no means anxious to part with their interest, while on the other hand, prices have reached levels that looked tolerably high and which, having regard to the still uncertain outlook in respect of the companies, possible extension of life for forty years, enforce caution upon the part of would-be investors. City of London ordinary went back to 50s. upon declaration of the 15 per cent. dividend, some people having looked for an increase. South Londons are 9d. up; St. James' and Pall Mall have risen 5s. Metropolitans are 1/16 down at 35s. Edmundsons went back to 33s. 9d. Newcastle-on-Tyne found friends from the North, and hardened to 17s. Various preference shares have gained small amounts.

The London Electric Supply Corporation report shows that the new shares, which were offered last summer, do not rank for participation in the dividend, making 10 per cent. for the year, which has just been declared. The figures are good and the company is making steady progress. The directors propose to split the present £3 shares into new shares of £1 each, a course which this year will probably be followed by nearly all the important companies that have not yet divided their shares into this popular denomination.

The Electrical Distribution of Yorkshire report again exhibits satisfactory expansion in the profits and extension of operations. The dividend on the ordinary shares remains unchanged at 7 per cent. free of tax, the new shares ranking this time for dividend. Another Northern company which has presented its accounts is the Clyde Valley Electrical Power Company. As the company raised its interim dividend from 2½ to 3 per cent., it was generally expected that the final dividend for the year would also be up, but the company has reduced its previous 5½ per cent. to 5 per cent., thus making 8 per cent. for the full year. A good deal of business is going on in the shares of the Midland Counties Electric ordinary, which stand at 21s. 9d. and last year received 5 per cent. dividend. This payment is made annually, in March, and anticipation looks for an increase to be declared next month. The return on the money on the basis of last year's dividend is £4 12s. per cent. Scottish Power ordinary, on their last 8 per cent. dividend, yield £6 6s. per cent.

Still cheapest amongst the London shares are Westminster ordinary, which are obtainable at 11 cum dividend, and, allowing for the inclusion of dividend and bonus, yield 7 per cent. Reference to our yield table is of particular interest just now, comparisons between the various returns offered by London companies' shares being illuminating and suggestive.

Home Railway stocks are inclined to sag by reason of the dock strike, though Metropolitans keep good, and are 10s. better on balance. Districts shaded off to 56. Underground £10 shares have weakened to 3, but the Income bonds at 103 show a point advance. There has been talk of the Underground Company's shareholders asking the directors, at this week's meeting, how it is that no dividend has been declared on the shares, and what may be the prospects of an early distribution. The gathering promised, in advance, to be of greater interest than usual.

London and Suburban Traction preference fell 1s. to 7s. on the halving of last year's 5 per cent. dividend. British Electric Traction ordinary is a good market, the price putting on 4 points to 72. Mexican issues present the strongest appearance in the foreign section, the Utility shares and bonds rising 4 to 5 points. British Columbia Railway stocks hold most of their recent substantial rises and Anglo-Argentine Trams are better.

The only quotable change in the Eastern Cable list is a small rise in Globe ordinary. Otherwise, prices are very quiet. Great Northerns have risen to 28. Anglo-American deferred at 22¾ shows a 5s. gain. Marconis rallied to 1¼; Radio Common are dullish at 18s. 9d. United River Plate Telephones are another 2s. 6d. higher at 6¾, the new shares, £2 10s. paid, remaining at 4.

Callenders and Henleys both went back a little: British Insulated advanced to 51s. 3d. Babcock and Wilcox, at 47s., rose superior to the heaviness which befell their prices as a consequence of the dock strike. Enfield Cable 7½ per cent. preference picked up to 21s. 9d. upon the news that five new directors have joined the board. Three of the quintette are also on the boards of the British Insulated, Callender's and Henley's. This gives the shares a new cachet in the eyes of the investor, who can get about £6 15s. 6d. per cent. on his money from the security. Rubber shares are an uninteresting market: the price of the material is a small fraction lower at 1s. 1¾d. per lb.

# Share List of Electrical Companies.

### Home Electricity Companies.

| | Nom. | Dividend. 1921. | 1922. | Price Feb. 18, 1923. | Rise or fall. | Yield p.c. |
|---|---|---|---|---|---|---|
| Brompton Ordinary ... ... | £ 1 | 12 | 12 | 44/6 | — | £5 8 1 |
| Charing Cross Ordinary ... ... | 5 | 9 | 14½ | 14⅝ | — | 5 9 6 |
| do. do. do. 4½ Pref. | 5 | 4½ | 4½ | 4⅝xd | — | 5 9 3 |
| Chelsea ... ... ... ... | 1 | 6 | 10 | 8/9 | — | 5 3 2 |
| City of London ... ... ... | 1 | 14 | 15 | 50/- | −2d. | 6 0 0 |
| do. do. 6 % Pref. ... | 1 | 6 | 6 | 23/- | +1/- | 5 4 4 |
| County of London ... ... ... | 1 | 8 | 10 | 9⅛ | — | 4 14 1 |
| do. do. 6 % Pref. ... | 1 | 6 | 6 | 22 6 | — | 5 6 8 |
| Edmundson's Ordinary ... ... | 5 | Nil | 7 | 5/16 | — 1/16 | 5 11 9 |
| do. 6 % Pref ... ... | 5 | 12/- | 6 | 4⅝ | — | 6 3 0 |
| Kensington Ordinary ... ... | | 10 | 12 | 10½ | — | 5 14 2 |
| London Electric ... ... ... | 3 | 4 | 10 | 5 | — | 6 0 0 |
| do. do. 6 % Pref. ... | 5 | 6 | 6 | 6½ | — | 5 9 1 |
| Metropolitan ... ... ... | 1 | 7 | 8½ | 12 | — 1/16 | 4 17 2 |
| do. 4½ % Pref. ... ... | 1 | 4½ | 4½ | 17/- | — | 5 6 0 |
| Newcastle-on-Tyne Ordinary ... | 1 | Nil | 9½ | 17/- | +9d. | 2 16 10 |
| do. 5 % Pref. ... | 1 | 5 | 5 | 15/6 | — | 6 9 0 |
| do. 7 % Pref. ... | 1 | 7 | 7 | 23/- | + 6d. | 6 1 9 |
| Notting Hill 6 % Pref. ... ... | 10 | 6 | 6 | 9½ | — | 6 6 4 |
| North Met. Elec. 6 % Pref. ... | 1 | 6 | 6 | 22/- | — | 5 9 1 |
| Urban Ordinary ... ... ... | 1 | Nil | — | 17/3 | — | Nil |
| do. 6 % Pref. ... | 1 | 2½ | 6 | 17/6 | — | 6 17 2 |
| St. James' and Pall Mall ... | 5 | 12 | 14½ | 18½ | + ½ | 6 9 8 |
| South London ... ... ... | 1 | 7 | 10 | 2 | +9d. | 5 0 0 |
| South Metropolitan Pref. ... | 1 | 7 | 7 | 24/6 | — | 5 14 8 |
| Westminster Ordinary ... ... | 5 | 10 | 12 | 10⅝ | — | 6 18 0 |
| Whitehall Elec. Invst., 7½ % Pf. | 1 | 7½ | 7½ | 1 | +3d. | 7 10 0 |

### Home Rails.

| | | | | | | |
|---|---|---|---|---|---|---|
| Central London Ord. Assented | Stock | 4 | 4 | 70½ | —1 | 5 13 6 |
| Metropolitan ... ... ... | ,, | 2½ | 3½ | 76 | + ½ | 5 5 3 |
| do. District ... ... | ,, | 1 | 3 | 56¼ | — ¼ | 6 5 0 |
| Underground Electric Ordinary | 10 | Nil | Nil | 3½ | — | Nil |
| do. do. "A" ... | 1 | Nil | Nil | 8/- | — | Nil |
| do. do. Income | Bonds | 4 | 5 | 102 | +1 | *5 16 6 |

### Telegraphs and Telephones.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Am. Tel. Pref. ... ... | Stock | 6 | 6 | 103 | — | 5 14 9 |
| do. Def. ... ... | ,, | 1½ | 34/6 | 22½ | + ½ | 6 11 10 |
| Chile Telephone ... ... ... | 5 | 6 | 6 | 5 1/16 | — | 5 3 6 |
| Cuba Sub. Ord. ... ... ... | 10 | 7 | 7 | 7½ | — | 9 13 1 |
| Eastern Extension ... ... | 10 | 10 | 10 | 17 | — | 5 17 8 |
| Eastern Tel. Ord. ... ... | Stock | 10 | 10 | 170½ | — | 5 17 4 |
| Globe Tel. and T. Ord. ... ... | 10 | 10 | 10 | 17½ | + ½ | 5 16 0 |
| do. do. Pref. ... | 10 | 6 | 6 | 11 | — | 5 9 1 |
| Great Northern Tel. ... ... | 10 | 24 | 22 | 22½ | + ½ | 7 14 4 |
| Indo-European ... ... ... | 25 | 10 | 7 | 22½ | — | *5 7 8 |
| Marconi ... ... ... ... | 1 | 25 | 15 | 1⅝ | + 1/16 | 8 0 0 |
| Oriental Telephone Ord. ... | 1 | 12 | 12 | 1⅝ | — | *6 8 0 |
| United R. Plate Tel. ... ... | 5 | 8 | 8 | 6⅛ | + ⅛ | *5 16 6 |
| West India and Panama ... | 10 | Nil | Nil | 1/- | — | Nil |
| Western Telegraph ... ... | 10 | 10 | 10 | 17 | — | *5 17 0 |

### Home and Foreign Trams, &c.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Arg. Trams. First Pref. | 5 | 5½ | 12½ | 8 3/16 | + 1/16 | 8 14 0 |
| do. do. 2nd Pref. | 5 | Nil | 5½ | 2½ | — | 10 4 8 |
| do. do. 5% Deb. | Stock | 5 | 5 | 74 | — | 6 15 2 |
| British Electric Traction Ord. | ,, | 4½ | 5 | 72 | +4 | 6 19 0 |
| do. do. 6% Pref. | ,, | 6 | 6 | 98½ | — | 6 1 10 |
| Brazil Traction ... ... ... | 100 | Nil | 4 | 65½ | — | 7 4 2 |
| Brit. Columbia Elec. Rly. Pcs. | Stock | 5 | 5 | 88½ | — | 5 13 0 |
| do. do. Preferred | ,, | 5 | 90/- | 89½ | +1 | *5 8 0 |
| do. do. Deferred | ,, | 5 | 137/- | 103½ | +1 | *6 5 0 |
| do. do. Deb. ... | ,, | 4½ | 4½ | 80½ | — | 5 6 0 |
| Lond. & Sub. Trac. 5 % Pref. | 1 | 3½ | 5 | 7/- | −1/- | 7 2 10 |
| London United Tram. Deb. ... | Stock | 4 | 4 | 66 | — | 7 2 10 |
| Mexico Trams. 5 % Bonds ... | — | Nil | Nil | 7⅝ | +5½ | 6 11 6 |
| do. 6 % Bonds ... | — | Nil | Nil | 49½ | — | Nil |
| Mexican Light Common ... | 100 | Nil | Nil | 23½ | +1½ | Nil |
| do. Pref ... ... | 100 | Nil | Nil | 49½ | +5 | Nil |
| do. 1st Bonds ... | — | Nil | 5 | 67½ | +5 | 7 8 2 |

### Manufacturing Companies.

| | | | | | | |
|---|---|---|---|---|---|---|
| Babcock & Wilcox ... ... | 1 | 15 | 20 | 47/- | +9d. | *4 5 2 |
| British Aluminium Ord. ... | 1 | 10 | 5 | 22/- | — | 4 11 0 |
| British Insulated Ord. ... ... | 1 | 15 | 15 | 2 7/16 | +9d. | 5 17 0 |
| Callenders ... ... ... ... | 1 | 15 | 15 | 48/3 | — ½ | 6 4 6 |
| do. 6% Pref. ... ... | 1 | 5½ | 6½ | 24/3 | — | 5 7 2 |
| Crompton Ord. ... ... ... | 1 | 10 | 5 | ½ | — | 10 0 0 |
| Edison-Swan ... ... ... | 4/- | 10 | Nil | 4/8 | — | 6 13 4 |
| do. do. 5% Deb. ... ... | Stock | 5 | 5 | 75½ | — | 6 12 5 |
| Electric Construction ... ... | 1 | 10 | 10 | 30/- | +3d. | 6 13 4 |
| English Electric ... ... ... | 1 | 5 | 5 | 17/6 | — | 5 14 3 |
| do. do. Pref. ... ... | 1 | 6 | 6 | 1 | — | 6 0 0 |
| Gen. Elec. Pref. ... ... ... | 1 | 6½ | 6½ | 22/6 | — | 5 15 7 |
| do. Ord. ... ... ... | 1 | 10 | 5 | 20/3 | — | 4 19 9 |
| Henley ... ... ... ... | 1 | 15 | 15 | 2 1/16 | + 1/16 | 6 3 0 |
| do. 4½ Pref. ... ... ... | 5 | 4½ | 4½ | 4⅝ | — | 5 2 10 |
| India-Rubber ... ... ... | 1 | 10 | — | ⅜ | — | *6 13 4 |
| Met.-Vickers Pref. ... ... | 2 | 5 | 5 | 9½ | — | 6 6 9 |
| Siemens Ord. ... ... ... | 1 | 10 | 10 | 10/9 | — | Nil |
| Telegraph Con. ... ... ... | 12 | 20 | 20 | 24 | — | *5 0 0 |

*Dividends paid free of Income Tax.

# Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

| CHEMICALS, &c. | | Price Feb. 19. | Formight's Inc. or dec. |
|---|---|---|---|
| a Acid, Oxalic ... ... ... ... | per lb. | 5½d. | ... |
| a Ammoniac, Sal ... ... ... | per ton | £60 | ... |
| a Ammonia, Muriate (large crystal) | ,, | £52 | ... |
| a Bisulphide of Carbon ... ... | ,, | ... | ... |
| a Borax ... ... ... ... ... | ,, | £25 | ... |
| a Copper Sulphate ... ... ... | ,, | £25 10s. | ... |
| a Potash, Chlorate ... ... ... | per lb. | 4d. to 4½d. | ... |
| a ,, Perchlorate ... ... ... | ,, | 4½d. | ... |
| a Shellac ... ... ... ... ... | per cwt. | £15 15s. | ... |
| a Sulphur, Sublimed Flowers ... | ,, | £7 15s. | ... |
| a ,, Roll ... ... ... | ,, | £7 15s. | ... |
| a Soda, Chlorate ... ... ... | per lb. | 3d. | ... |
| a ,, Crystals ... ... ... | per ton | £5 to £5 5s. | ... |
| a Sodium Bichromate, casks ... | per lb. | 4½d. | ... |
| **METALS, &c.** | | | |
| b Aluminium, Ingots ... ... ... | per ton | £115 to £120 | ... |
| b ,, Wire ... ... ... | per lb. | 1/9 to 2/6* | ... |
| b ,, Sheet ... ... ... | ,, | 1/6 to 2/- | ... |
| p Babbitt's Metal and Anti-friction Metal— | | | |
| Grade I ... ... ... | per ton net | £255 | £20 inc. |
| Grade II ... ... ... | ,, ,, | £181 | £14 inc. |
| Grade III ... ... ... | ,, ,, | £96 | £5 inc. |
| c Brass (rolled metal 3" to 12" basis) | per lb. | 10d. | ½d. inc. |
| c ,, Tubes (solid drawn) ... | ,, | 1/0½ to 1/0½d. | ½d. inc. |
| c ,, Wire, basis ... ... | ,, | 10½d. | ½d. inc. |
| c Copper Tubes (solid drawn) ... | ,, | 1/1½ | ½d. inc. |
| c ,, Bars (best selected) ... | per ton | £95 | ... |
| c ,, Sheet ... ... ... | ,, | £95 | ... |
| c ,, Rod ... ... ... | ,, | £95 | ... |
| d ,, (Electrolytic) Bars ... | ,, | £71 | £5 inc. |
| d ,, ,, Sheets ... | ,, | £145 10s. | ... |
| d ,, ,, Wire Rods ... | ,, | £81 | £5 inc. |
| d ,, ,, H.C. Wire | per lb. | 10½d. | ½ d. inc. |
| f Ebonite Rod ... ... ... ... | ,, | 2/- to 3/6 | ... |
| f ,, Sheet ... ... ... | ,, | 2/- to 3/6 | ... |
| n German Silver Wire ... ... | ,, | 2/8 | ... |
| h Gutta-percha, fine ... ... ... | ,, | 6/6 | ... |
| h India-rubber, Para fine ... ... | ,, | 1/0 | ½d. dec. |
| Iron Pig (Cleveland Warrants) ... | per ton | £5 2s. to £5 2s. 6d. | ... |
| l ,, Wire, galv. No. 8, P.O. qual. | ,, | £25 | ... |
| g Lead, English Pig ... ... ... | ,, | £36 5s. | 45/- inc. |
| g Mercury ... ... ... ... | per bot. | £9 15s. | ... |
| e Mica (in original cases) small ... | per lb. | 8d. to 3/- | ... |
| e ,, ,, medium... | ,, | 4/- to 8/- | ... |
| e ,, ,, large ... | ,, | 10/- to 20/- & up. | ... |
| p Phosphor Bronze, plain castings | ,, | 1/- | 1½d. inc. |
| p ,, drawn bars and rods | ,, | 1/4 | ½d. inc. |
| p ,, rolled strip & sheet | ,, | 1/3½ | ½d. inc. |
| p ,, wire ... ... ... | ,, | 1/4½ | ½d. inc. |
| o Platinum ... ... ... ... | per oz. | £25 | ... |
| d Silicium Bronze Wire ... ... | per lb. | 1/0½ | ½d. inc. |
| r Steel, Magnet, in bars ... ... | ,, | 10d. | ... |
| m Tin, Block (English) ... ... | per ton | £231 to £231 10s. | £22 15s. to £24 inc. |
| m ,, Wire, Nos. 1 to 16 ... ... | per lb. | 9/-1 | ... |

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Tull & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

**Modern Salesmanship.**—An address upon this subject was given by Mr. R. E. Meadows on January 24th at an E.D.A. Salesmanship Conference held at Newcastle-on-Tyne. The speaker said that the wedding of science to salesmanship had raised the latter to the dignity of a profession. Salesmanship was simply the meeting of minds and the bringing of them into common agreement—this could be done by personal contact or by various forms of advertisement. In connection with the last, the speaker believed that too many firms were content to "potter" with advertising instead of giving it a fair trial. New goods were not manufactured to meet a demand, the demand had to be created. There was a need for the study of psychology in advertising. The way in which a statement was made was a deciding factor in the value of an advertisement. Advertising should not be regarded as an expense but as an investment. As an example of the result of correct advertising, Mr. Meadows instanced the gas industry, from whose book the electrical industry should take a leaf. Attractive showrooms were effective "silent salesmen"; many a sale was made through the art of the window dresser. Turning to the personal element, the speaker said that salesmanship was the power of persuasion, not compulsion—the education of a prospective buyer as to the merits of an article. The four elements which went to complete a sale were: A thorough and intimate knowledge of the merits of the goods; education of the public through persistent advertising; the establishment of smart showrooms; and a thorough training in the principles underlying the building-up of the electrical industry.

**Kelvin's Centenary.**—The centenary this year of Lord Kelvin's birth (June 26th) is to be celebrated at the British Empire Exhibition on July 10th and 11th by a meeting, a dinner, an exhibition of Lord Kelvin's apparatus, and the production of a memorial volume.

# The French Physical Society's Exhibition.

(*Concluded from page 250*).

### A New Stroboscope.

In order to study the motion of the prongs of the tuning fork and of the pawls of the tuning-fork motor (p. 208), M. Guillet devised a new stroboscope with a vibrating string, as shown in fig. 10. The string is stretched in a vertical position and is kept in vibration by an electromagnet fixed on the left-hand pillar, which is energised by a small battery, contact being made by the motion of the string near the foot of the latter. A disk fixed half-way up carries a slit which is obscured when the string passes over it. The frequency of vibration can be varied over several octaves by varying the tension of the string with a calibrated screw fixed at the top of the apparatus. By adjusting the frequency of the string to a value slightly different from that of the mechanism to be examined, the latter, when viewed through the slit, appears to be moving as slowly as may be desired, or, at synchronism, to be stationary at any desired point in its travel—in which case it can be photographed. The device has many obvious applications, and has the merits of simplicity and wide range of frequency.

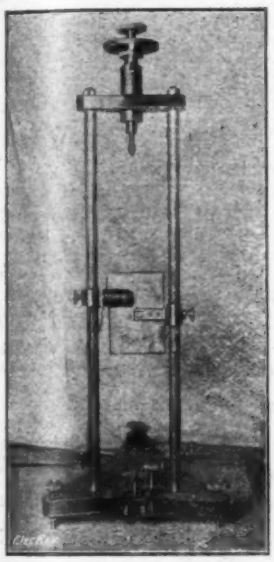

Fig. 10.—The Guillet String Stroboscope.

### The Givaudan "Photosculpture" Apparatus.

An ingenious apparatus has been devised by M. Givaudan for producing portraits in relief. As shown in fig. 11, it consists of five large radial tubes, each fitted with a powerful electric lamp whose rays are concentrated on the head of the subject. The latter sits in a chair, which can be moved axially; his head is illuminated in a different way after each change of position, and is photographed in successive positions, giving a series of photographic profiles, which are afterwards transferred by photography to thin metal sheets. The sheets are cut out to the outlines thus obtained, giving a series of silhouettes of the successive profiles, and as all the plates are accurately registered with one another by means of perforations, when superposed in proper order, they form a matrix from which any number of copies in relief of the portrait can be cast or moulded. These portraits may be of any desired size, from medals to medallions, and may be of any metal or other suitable material.

Fig. 11.—Apparatus for "Photosculpture."

Fig. 12.—Improved Baudot Apparatus.

### Envelope-sealing Machine.

Fig. 13 shows a device for sealing envelopes, which are fed into it by a travelling belt of any desired length. Letters placed on the belt with the addresses uppermost are seized by two rollers and pass over a damping roll; afterwards they pass between cylinders heated internally with electrical resistances, which warm the moisture and soften the gum on the flap of the envelope. Two ranges of compressing cylinders, similarly heated by electricity, dry and seal the letter and throw it out. The ranges of cylinders, as illustrated, are made in two or three independent sections, to facilitate the passage of letters of all sizes and shapes, and all thicknesses; the thicker the letter the greater the pressure exerted upon it, to ensure a sound seal.

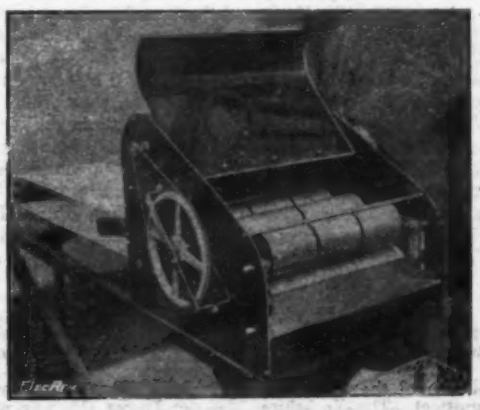

Fig. 13. Envelope Sealing Machine.

### The Belin Radio-telestereograph.

The work of M. Edouard Belin in developing the transmission of pictures and drawings by telegraph is well known; last year he transmitted handwriting by wireless telegraphy between France and the United States with apparatus similar to that which has recently been put into regular operation between Paris and Strasburg, and Paris and Lyons. A special system of synchronisation is employed, of which the mechanism is here illustrated (fig. 14).

A drum containing the receiving cylinder is shown, with its driving mechanism, in front of which is the synchronising apparatus. A chronometer sends a current at each second into an electromagnet E (fig. 15), the armature A of which at each impulse approaches a contact C carried on a revolving disk H. This disk, which can be regarded as another chronometer, carries a second contact D on its periphery, and revolves once a second, making contact between D and a contact K fixed to a toothed wheel O, and thus closing the circuit of a second electromagnet which acts directly on the spindle of the cylinder contained in the drum.

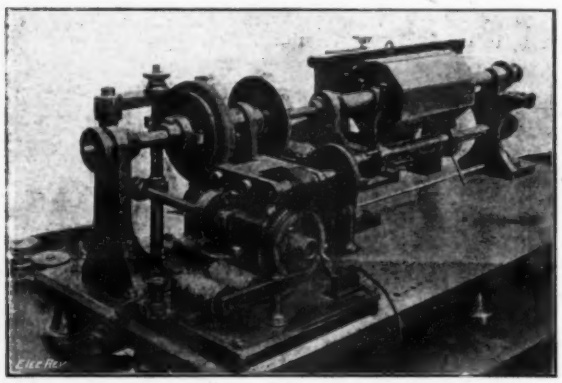

Fig. 14.—The Radio-telestereograph.

A chronometer at the sending station sends impulses by wireless telegraphy, which are heard by the receiving operator; he hears also the beats of his own chronometer, and when the two coincide the two apparatus are in synchronism. To bring this about, he turns the crank M of the worm V to adjust the position of the contact K. When synchronism is thus attained, transmission may be commenced.

### Improved Baudot Apparatus.

M. Grunenwald has endeavoured to improve the Baudot apparatus by increasing the speed of rotation from 210 to 310 r.p.m., by rigorous synchronisation of the distributor and translators belonging to the same installation. For this purpose he has added at the end of the shaft carrying the brush-holder of the distributor a current reverser which drives the electromotor of each translator (fig. 12).

The reverser is a tube of insulating material carrying raised contacts which engage with brushes, the currents collected by the latter being directed into the electromotor of each translator, and thus eliminating the weight of the driving spring or of the direct drive by an independent motor. The electromotor consists of a bipolar stator with two polar extensions which receives the alternating current, and a rotor in the form of a ring carrying two windings and two pole-pieces,

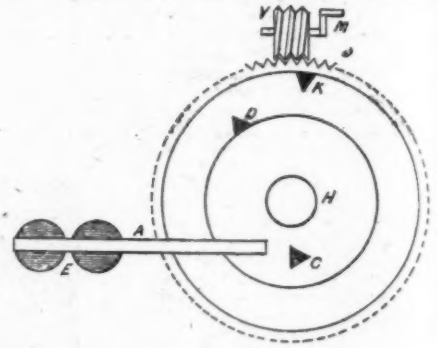


Fig. 15.—Synchronising Device.

which is fed with direct current through slip-rings. The device is very simple and strong, reliable, and of small dimensions. Although the motor may vary slightly in phase of rotation, it is stated that it can be depended upon to an accuracy of about 1/400 second.

The introduction of American perforators into the French telegraph service has stimulated other inventors to devise perforators better adapted to French practice; M. Chattelun and the firm of Carpentier showed patterns much lighter than the American machine.

Both employ keyboards actuating separate perforators of simple construction, having five electromagnetic perforators corresponding to the five keys of the ordinary Baudot keyboard—in effect, a second keyboard actuated by the typewriter. But in the Chattelun perforator a wide ribbon of paper with round holes is used, whereas in that of M. Carpentier the tape is narrow and has rectangular perforations. In both systems, the perforations are arranged in accordance with the Baudot code in such manner that they are easily read. These apparatus are shortly to be put to the test on some important French circuits.

# The West Riding (Aire and Calder) Electricity District.

## Electricity Commissioners' Second Inquiry.

It will be recalled that schemes for the reorganisation of the supply of electricity in the above-named district, which was delimited in June, 1920, were submitted by the Leeds Corporation in January, 1921, and also by the Conference of Local Authorities (Bradford) and the Yorkshire Electric Power Co. in March of the same year. The proposals were considered by the Electricity Commissioners at their first local inquiry in May, and the decision come to was issued in draft form in November of that year. In December, 1922, a conference took place, and last week the second inquiry was held. It took place at Bradford on the 13th inst., and the constitution of a Joint Electricity Authority for the area was considered.

Sir John Snell presided, and was supported by fellow Commissioners, Sir Harry Haward (vice-chairman), Mr. A. Page, and Mr. H. Booth, accompanied by Mr. J. C. Dalton and Mr. D. S. Cumberlege. Of the three electricity supply authorities that had submitted rival schemes, the Conference of West Riding Local Authorities (including the Bradford Corporation and a considerable number of other authorities) was represented by Mr. A. T. Miller, K.C., and Mr. Jacques Abady (instructed by Mr. N. L. Fleming, Town Clerk of Bradford and solicitor to the Conference), and Mr. Wilfred Turner (chairman of the Conference and of the Bradford Electricity Committee). The Yorkshire Electric Power Co. was represented by Mr. Rowland Harker (instructed by Messrs. Barr, Nelson & Co., of Leeds) and Mr. W. B. Woodhouse (engineer and manager to the company); and the Leeds Corporation, by Mr. W. Wooll (barrister), instructed by Sir Robert Fox (Town Clerk), who was also present.

Mr. Rowland Harker (Yorkshire Electric Power Co.) asked, and was granted, permission to make a statement before the inquiry proceeded. The company was ready to agree to a scheme, provided its position was reasonably safeguarded, and generally to accept the arrangements outlined in the report by the Engineers' Committee, subject to a satisfactory decision by the Commissioners as to the future organisation in the Company's area as a whole and to an amendment of the Company's powers on the lines suggested in the Company's representations of December, 1920. The draft scheme did not meet the company's requirements. He made two alternative suggestions: First, that it was desirable, in respect of the delimitation of the Aire and Calder and North-East Midlands Districts as at present suggested, that a Bill should be promoted by all the interested parties which would remove certain difficulties; and, secondly, that there should be a redelimitation of the areas suggested. The terms on which the Company was prepared to give its consent were: (1) that a satisfactory scheme be adopted for the remainder of the Company's area; (2) that the Company's distribution in area "B" should be maintained and extended; (3) that the Company should be the sole bulk supply authority for area "B" and for such part of the Company's area as was in the North-East Midlands District; (4) that the Company should be secured against the creation of overlapping powers; (5) that the Company's powers in area "A" should not be relinquished, nor overlapping powers created, until the Company was assured that the protection for that area would be carried out; and (6) that there should be no interference by the Joint Electricity Authority in the management of the Company's business. Originally, said Mr. Harker, it had been proposed that a contract of supply for 36,000 kVA should be agreed upon between the Company and the Joint Authority, but the Company had been beaten down to 20,000 kVA for fifteen years. It was prepared to agree to that variation in quantity. There was between £2,500,000 and £3,000,000 invested

in the Company. With regard to the proposed Bill, the present scheme for the Aire and Calder District did not deal with the Company's area in the North-East Midlands District, and he suggested that in the Bill that area should be dealt with in conjunction with the Aire and Calder area, or by itself. He asked that the Company's distribution powers in area "B" should be maintained, and that Wetherby, Riccall, and Tadcaster, now on the fringe of the Company's area of supply, should be brought within its area so that it could supply electricity when the demand arose. The Company should be the sole supplier in area "B" and part of the area in the North-East Midlands District. He suggested that the Company should be given a contract for 20,000 kVA in respect of bulk supply to area "A," but before the Company could accept that, somebody else must be prepared to take that supply and must be in a position to carry out the obligations. He did not think there was any difference between the parties on this matter. The Company considered that there should be a definite contract for the 20,000 kVA for fifteen years. The contract could be referred to the Joint Authority, but the municipalities would still remain responsible if the Joint Authority did not carry out the contract. Overlapping could be dealt with by a Parliamentary Bill. The Company demanded complete autonomy within the limits of its area of supply and offered the following alternatives to the scheme included in the Order:—First, the promotion of a Bill by all the authorities concerned, as previously mentioned—subject to the Commissioners' approval—which would remove the difficulties indicated and make provision for the protection for which the Company asked. Secondly, that there should be redelimitation of the areas. The Commissioners, the Company suggested, should form the present reserved area "A" into a district, in respect of which they should have whatever authority they thought proper. The Yorkshire Electric Power Co. would cease to have any interest in that reserved district, except with regard to bulk supply contracts and the transference of its property in that district, and one or two other points, one of which would be the right to lay mains through that district in order to reach the remainder of its area of supply. The Commissioners, Mr. Harker went on, should then form another district altogether, comprising the whole of the remainder of the Company's statutory area of supply. That, he recognised, would involve an alteration of the North-East Midlands District, but he put this forward as a practical suggestion to avoid many pitfalls, some of which were important legal difficulties. With regard to certain areas within the immediate neighbourhood of Rotherham, it might be that adjustments could be made, and if these suggestions were regarded favourably, the Power Co. would ask that if it were thought necessary to set up any new body for the new district, the powers of that body should be transferred to the Company.

MR. A. T. MILLER, K.C. (Bradford Conference of Local Authorities), said Mr. Harker's proposals had come as a "bombshell" to the other parties. It was only the previous evening that he had received a hint of what the Power Co. was going to "explode" at the beginning of the inquiry, whereas they had all thought they were to hear an agreed scheme by the Commissioners. The Conference had had a hurried meeting that morning to consider the astonishing attitude of the Power Co., which was received with regret and indignation. Mr. Harker's suggestions involved the scrapping of the existing scheme, just as the negotiations at the end of the previous inquiry involved the scrapping of the scheme then before the Commissioners. The Conference took a very strong view of the matter.

MR. E. WOOLL (Leeds Corporation) said his client felt entirely in sympathy with what Mr. Miller had said. He asked for a short adjournment in order that the position might be considered. Leeds had only one general criticism of the scheme, and that was in relation to the clause providing for the promulgation of the scheme with the control of interconnected stations. This was felt to be inconsistent with the Leeds demand for independent control of its own stations. Leeds could not be compelled to relinquish that control, but was willing to concede the principle of inter-connection under Section 33.

SIR JOHN SNELL, after consulting his colleagues, said the Commissioners had understood that the Power Co. agreed to the main principles of the scheme, and that it did not even now withdraw or object to the scheme on its merits. The Company held that the draft Order could not legally give the guarantee it desired before consenting to the scheme. The Commissioners understood that all parties agreed to the main principles of the scheme, which were the establishment of reserved area "A," which the Company consented to evacuate, subject to a bulk supply contract of an agreed amount to be given by the Company from its new Ferrybridge station to the reserved area, and to be taken by the undertakers in that area; and that in all areas in area "B" not now covered by authorised undertakers, the Power Co., in addition to its statutory rights of supplying power, would have general rights of electricity supply in such present unoccupied areas. The Commissioners could not view with equanimity any proposal to begin all over again, and therefore agreed to an adjournment.

Upon re-assembly at 3.30 p.m., MR. MILLER said the parties had been in consultation, and it was upon the second of the agreed principles that one of Mr. Harker's difficulties appeared to arise. Mr. Miller was glad to say that the Conference authorities—and he believed Leeds would also be with them—did not regard Mr. Harker's difficulty as insuperable, and were quite willing to devise a method.

MR. WOOLL said he thought there was a real prospect of agreement. The second alternative suggested by Mr. Harker with respect to the redelimitation of the area was, Leeds Corporation thought, perhaps the most practicable way out of the difficulty, and it was prepared to go some way in supporting the solution which recommended itself to the Conference authorities. It was a condition of its identification with the scheme, however, that it would not be subject to the form of control indicated in Clause 5 of the 2nd Annex with regard to its own generating station.

The Chairman agreed to the requested adjournment.

*(To be concluded.)*

# Salaries Paid in the Engineering Profession.

THE Society of Technical Engineers has taken a Census of the salaries at present paid in the engineering profession. A summary of the information collected on the subject is given in the following tables:—

**Salaries of Staff Engineers, 1923.**

| Age. | Table I. Average for all Engineers. | Table II. Average for Assistant Engineers. |
|---|---|---|
| | £ | £ |
| 22 | 150 | 150 |
| 24 | 195 | 185 |
| 26 | 240 | 220 |
| 28 | 285 | 255 |
| 30 | 325 | 285 |
| 32 | 365 | 315 |
| 34 | 400 | 340 |
| 36 | 430 | 355 |
| 38 | 460 | 370 |
| 40 | 485 | 380 |
| 42 | 505 | 390 |
| 44 | 520 | 395 |
| 46 | 535 | 400 |
| 48 | 545 | 400 |
| 50 | 555 | 400 |

Table I is arrived at from all the figures returned, including salaries as high as £1,500, and covers staff engineers in many different sections of engineering. Table II gives the average salaries paid to assistant engineers engaged in electrical manufacturing.

The Society states that most of those covered by the Returns are fully qualified men who have had a training as long and expensive as that necessary for other professions, but their incomes are much lower, being insufficient to enable them to maintain a suitable standard of living or to allow them to train their sons for entry to the profession.

The work of the technical engineer is in large measure the key to the success of modern industry, but unless steps are taken by those most closely concerned to improve materially the existing standard of salaries it will neither be possible to continue to recruit the right type of men for the profession nor to prevent present discontent within its ranks from increasing to a serious degree. It is common knowledge among staff engineers that under present conditions their work is hampered by anxiety as to their personal finances.

A considerable increase in salaries would add very little to the cost of the manufactured product, and this would be much more than compensated for in a short time by increased efficiency.

The Society appeals for the support of all members of the profession in its efforts to raise the existing standard of salaries, and looks for the co-operation of all employers to the same end. It is not a militant Trade Union and does not believe in the use of the strike weapon for the promotion of its objects. Rather, on account of the strength of its case it expects to establish better conditions by friendly negotiations with those responsible for the financing of the engineering and allied industries, as well as by the pressure of enlightened public opinion and the support of the engineering profession as a whole.

**Medium Pressures in French Networks.**—The Electrical Energy Commission, which was established by the French Parliamentary Committee of Commerce some time ago, has adopted the conclusions of a report prepared by M. Eschwege concerning electrical networks at medium pressures, which, it is recommended, should be limited to pressures between 5,500 and 45,000 volts. At the same time the Commission has decided to draw the attention of the Government to the desirability of establishing permanent contact between the Ministry of Public Works and the Union des Syndicats de l'Electricité.

# Exports and Imports of Electrical Goods and Machinery in January, 1924.

FROM the ensuing table it will be observed that the total of exported electrical goods and apparatus during January was less than half that of the previous month. This is entirely due to the abnormal exports of submarine cable which took place in December, although it must be said that the January exports under this head were lower than usual—a natural reaction. Leaving this item out of account, it is seen that the position was really favourable in comparison with December; there were substantial increases in the export of insulated wires and cables, meters and instruments, "other" motors and generators, switchboards, and telegraph and telephone instruments and apparatus. The decreases, on the other hand, were not proportionately large.

Imports as a whole showed a minor decrease as compared with the December figure. Glow lamps were less than half the value of those imported in the preceding month, while noteworthy decreases are shown under the heads of unenumerated electrical goods and apparatus, insulated wires and cables, and unenumerated electrical machinery. Conversely, there were rises in the imports of batteries and accumulators, meters and instruments, and telegraph and telephone instruments and apparatus. Re-exported goods were returned at a higher figure principally on account of the increase under the head of telegraph and telephone instruments, &c.; otherwise the rises and falls were fairly evenly balanced. It will be noticed that all three main totals are higher than were those for January last year.

| | Exports. | | | Imports. | | | Re-Exports. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Electrical exports for Jan. 1924. | Inc. or dec. as compared with Dec., 1923. | Inc. or dec. as compared with Jan., 1923. | Electrical imports for Jan., 1924. | Inc. or dec. as compared with Dec., 1923. | Inc. or dec. as compared with Jan., 1923. | Electrical re-exports for Jan., 1924. | Inc. or dec. as compared with Dec., 1923. | Inc. or dec. as compared with Jan., 1923. |
| Electrical goods and apparatus (unenumerated) ... ... | £143,757 | — £7,285 | + £16,668 | £72,257 | — £12,417 | + £9,791 | £5,717 | + £1,565 | — £1,597 |
| Insulated wires and cables ... | £215,743 | + 27,837 | + 11,127 | 25,148 | — 6,629 | + 1,180 | 165 | — 229 | — 1,094 |
| Glow lamps ... ... ... | 27,319 | — 1,598 | — 1,713 | 12,615 | — 13,757 | — 11,529 | 4,178 | + 3,839 | + 4,037 |
| Arc lamps and parts ... ... | 1,529 | + 257 | + 999 | 945 | — 1,739 | — 1,616 | 148 | + 135 | — 222 |
| Batteries and accumulators ... | 54,074 | — 2,808 | + 6,719 | 21,929 | + 6,874 | + 9,659 | 270 | + 80 | + 265 |
| Meters and instruments ... | 46,687 | + 12,674 | + 21,053 | 16,886 | + 8,039 | + 6,709 | 363 | — 1,212 | — 2,187 |
| Carbons ... ... ... ... | 1,765 | — 1,388 | — 4,905 | 9,990 | + 85 | + 5,783 | 36 | — 51 | — 89 |
| *Electrical Machinery—* | | | | | | | | | |
| Electrical machinery (unenumerated) ... ... ... | 175,849 | — 13,379 | + 11,827 | 70,674 | — 8,993 | — 40,302 | 7,359 | — 305 | + 1,598 |
| Railway and tramway motors | 39,849 | — 274 | + 23,028 | — | — | — | — | — | — |
| Other motors and generators ... | 237,103 | + 54,513 | — 16,956 | — | — | — | — | — | — |
| Switchboards (not telegraph or telephone) ... ... | 13,287 | + 8,387 | — 2,221 | 5 | — 108 | — 75 | — | — | — 1,186 |
| *Telegraph and Telephone Cable and Material—* | | | | | | | | | |
| Telegraph and telephone wires and cable (not submarine) | 66,521 | — 208 | + 11,612 | 4,215 | + 135 | — 4,178 | — | — 5 | — 39 |
| Submarine telegraph and telephone cable ... ... ... | 36,373 | — 1,877,841 | — 38,748 | — | — | — | — | — | — 4 |
| Telegraph and telephone instruments and apparatus ... | 195,794 | + 13,511 | + 21,070 | 61,617 | + 10,715 | + 36,757 | 14,989 | + 9,631 | + 13,654 |
| Totals ... ... | £1,255,650 | —£1,787,602 | + £59,560 | £296,281 | — £17,795 | + £12,179 | £33,225 | +£13,448 | +£13,205 |

# Loud Speakers for Wireless and other Purposes.

## A Joint I.E.E. and Physical Society Discussion.

THE introductory papers to this discussion, which were read at the Institution of Electrical Engineers on November 29th, were abstracted in our issues of December 7th and 14th last. The discussion was resumed on February 14th, Mr. C. C. Paterson, O.B.E., being in the chair.

SIR RICHARD PAGET said that he agreed with Mr. Sunderland that intelligibility was a matter of precision (or faithfulness) rather than amplitude. Many consonants were transients, and "explosives," such as "P," "B," and "T" differed only in the "shape of approach" towards the vowel sound. The ideal reproducer would be sensitive to frequency changes and at the same time be free from resonances which would permit certain sounds to linger on after their allotted span. Much depended upon the ability of the ear to take certain extraneous sounds for granted. The vice of the horn lay not in the fact that it had resonances of its own, but in that these were given exaggerated value. In considering the range of frequencies, great importance had to be attached to frequencies of from 2,000 to 3,000 as one limit and from 6,000 to 7,000 as the other. The lowest (nasal) resonances were below 200. The difference between the explosive consonants was one of amplitude—this was another point to consider. Reproducing systems must therefore compromise between sensitiveness over wide ranges of frequencies and amplitude.

CAPT. B. S. COHEN stated that Sir Oliver Lodge had demonstrated a loud speaker at the Institution in the early part of the present century, and it was very successful. It had a moving coil and a large wooden diaphragm. The perfect loud speaker would be one in which the ratio of input to output would be unity at all ranges of frequency and amplitude. The speaker exhibited apparatus for the measurement of characteristics of telephones adapted for the testing of loud speakers. This consisted of a source of constant current, a heterodyne oscillator designed to give all ranges of frequency by means of an air condenser moving through 180 deg., two h.f. components, a detector, and l.f. amplification. The acoustic output was directly recorded, and a frequency-amplitude curve obtained by means of a spot of light on a ruled screen. By this means Capt. Cohen demonstrated the variations with which a loud speaker was expected to deal—a very difficult task indeed.

MR. G. H. NASH said that he represented the practical side of the question. The outstanding problem was whether to use a horn or do away with it. Dr. Rankine urged them to avoid a horn if possible. Capt. P. P. Eckersley had shown a hornless loud-speaker, but this, while it reproduced the low frequencies satisfactorily, was very inefficient. The low frequencies dominated the rest, and to get adequate results more valves were needed. Distortion in a loud speaker was not entirely due to the horn. The output of a valve depended upon the voltage applied to the grid. To obtain undistorted speech from an ordinary loud speaker, it was necessary to have a minimum of 6 V on the grid and 100 V on the plate; these values had to be greatly exceeded if a low-efficiency loud speaker was used. The horn was a perfectly natural loud speaker, and it was doubtful if the distortion was generally so bad as it was represented to be.

CAPT. H. J. ROUND said that distortion in a valve was generally produced by two effects—the curvature of the plate current characteristic, and the voltage-dropping effect of the grid current. So that these effects might not enter, the peak voltages of the telephone current to be magnified must not exceed certain values. The voltage limitation could be increased by increasing the size and power of the valves, but this could not be done economically in the transmitter itself. The natural sounds which it was desired to transmit had all sorts of peak amplitudes at all frequencies. The adjustment of the microphone might be such that the low notes produced 10 V, whereas the high notes produced only 0.1 V. In this

use the transmitter would be fully used for the low notes, and used hardly at all for the high notes. This meant that at the receiving end it was possible that 1 kW was being obtained for one note and perhaps only one thousandth of a kilowatt for another. If there were no atmospherics and valve noises, this difficulty would be overcome, but in general these interferences would be of the same amplitude at all frequencies. The speaker had found from tests that very approximately equal amplitude of modulation was given to the transmitter from 200 frequency to 5,000 frequency for sounds of unity audibility, taking as a standard the average of a number of observers. Unity audibility might be objected to, but it was the easiest thing to get without complex apparatus. A receiver in which there was no appreciable electrical distortion would give different audibilities for different frequencies instead of equal audibilities. But if a sufficiently-damped rejector circuit was connected in series with the telephones, although the total noise would be reduced, the fine quality of the sound would be missed. Probably before long it would be possible for the N.P.L. or the B.B.C. to establish a frequency-strength standard which would minimise the difficulties.

MR. W. J. BROWN said that Prof. Fortescue had shown the need for a last valve with an anode voltage of 200. A 20-W valve was observed to have a maximum distortionless output of from .01 to .1 W. The maximum output was obtained when the valve impedance was twice that of the output circuit, whereas maximum amplification was obtained when these impedances were equal. The speaker exhibited curves explaining his remarks.

MR. A. H. DAVIS (N.P.L.) stated that ordinary speech was 1,000 times the minimum for audibility. The magnification of ordinary speech a thousand times was painful. Different persons had different aural characteristics, and the same sounds were given various values. He showed curves which indicated the minimum amount of distortion which the average ear could appreciate. He thought that the variations due to the horn of a loud speaker were not likely to be very serious.

MR. A. J. ALDRIDGE said that a serious error which occurred in many loud speakers was the greater inward deflection of the diaphragm. This might be rectified by the use of a larger diaphragm or by moving it further away from the magnets.

MR. G. C. MARRIS thought that all the trouble was due to the desire to obtain volume and accuracy at one and the same time. The aim should be to produce a loud speaker which could be worked off the largest valve used in an ordinary house. The disadvantage of the horn was not so much its distortional effect as its emphasis of certain notes. In his opinion the output of the average loud speaker was too high.

MR. W. E. BURNAND said that certain extraneous sounds could be traced to the amplifier. Insufficient prominence had been given to the effects of harmonics and overtones, although these were very serious at times. He had discovered that when two loud speakers were connected in series, sometimes one and sometimes the other gave out the greater volume of sound—he put this down to the effects of harmonics. It was probable that a number of horns or a number of air passages combined in one loud speaker would give improved results. From his experience in transformer design he had come to the conclusion that the best form of transformer for loud-speaker work was something partaking of both series and shunt characteristics.

CAPT. NORMAN LEA reviewed a number of statements made by the authors of the introductory papers.

DR. H. M. BARLOW said that he was engaged in developing a novel type of telephone. The Johnsen-Rahbek effect, which was demonstrated at the Institution some time ago, could be obtained with a semi-conductor (lithographic stone for instance) in contact with mercury. The speaker was experimenting with apparatus consisting of a slab of semi-conductor with a concave under surface resting on the face of a quantity of mercury. Connections were taken from a sheet of tinfoil upon the other face of the semi-conductor and from the mercury. The reception of currents caused the forces acting between the two surfaces to set up oscillations, and the air contained in the hollow face of the semi-conductor was squeezed through a hole in the latter, and sound was reproduced.

MR. P. VOIGHT exhibited an arrangement of the nature of a Wheatstone bridge whereby the input side of a transformer took the place of the galvanometer across the bridge feeding back the out-of-balance current to a note magnifier. It was demonstrated that improved results were obtained from a loud speaker by this means. The speaker said that the greater part of the distortion in a loud speaker was not due to the horn at all, but to the mechanism.

# New Electrical Devices, Fittings, and Plant.

*Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.*

### An Auto-Electric Three-wheel Vehicle.

In order to meet the needs of those whose business, while demanding a system of delivery or distribution, does not call for the use of large vans, the AUTO ELECTRIC CO., of 79, Windsor House, Westminster, S.W.1, provides a small inexpensive three-wheel electric vehicle, an example of which is illustrated in fig. 1. A variety of bodies has been standardised for the requirements of different trades, and for the same purpose the gear ratio of the vehicle has been made readily adjustable. The van is capable of maintaining a speed of about 20 m.p.h. over average roads, and of covering 50 miles per charge. The Langham motor is rated at 1.5 h.p. at 44 volts, has an overload capacity of 200 per cent., and its commutator and brush gear are easily accessible. Series-parallel control provides five forward and five reverse speeds, the reduction gear being incorporated in the motor end cover, and the final drive is by chain to the single rear wheel. The latter is sprung by two cantilever springs attached to shackles on a pivoted frame and the motor is slung on a hinged shaft transversely to the frame, the chain adjustment being made by swinging the motor through an arc. The rear wheel is provided with two independent brakes which may be interlocked with the controller if required and the 160-Ah battery is underslung from the frame at its centre, which reduces the possibility of the vehicle's skidding or overturning when cornering. While the standard box body has a capacity of nearly 40 cu. ft., the overall length of the van is only 9 ft., its width 4 ft. 6 in., height 6 ft. 9 in., and weight, complete with battery, 19 cwt. Ball bearings are provided throughout, and the vehicle is of British manufacture entirely.

Fig. 1.—The Auto-Electric 8-cwt. Three-wheeler.

### High-speed Electric Motors.

MESSRS. MAWDSLEY'S, LTD., of Dursley, Gloucestershire, who have made a speciality of extra-high-speed electric motors, have sent us the accompanying illustration (fig. 2) of a 25-h.p. motor running at 10,000 r.p.m., which they have recently built and supplied to the order of one of the largest industrial firms in this country. There are many difficulties in connection with the design and manufacture of these extra-high-speed machines, which Messrs. Mawdsley's claim to have successfully solved. In the machine in question the centrifugal force per lb. at the circumference of the armature is nearly four tons, so that special care had to be taken not only in the choice of materials, but also in the design. Another difficulty is that of keeping the temperature rise within reasonable limits, owing to the core losses due to the high frequency. In this motor a fan (machined from a solid steel disk) is fixed on the armature shaft delivering air into a trunk, so arranged as to direct jets of air on to the armature, and also on to the commutator, and this has proved so satisfactory that the temperature rise is within the British Engineering Standard Specification limits after a seven-hour full-load run.

The principal difficulty in the manufacture of these high-speed machines, besides heating and commutation, is in the bearings. At 10,000 r.p.m. the ordinary ball thrust bearing was found to be unsatisfactory, on account of the heat generated by the friction of the balls in the cage, and a special type of bearing was used, which proved very satisfactory,

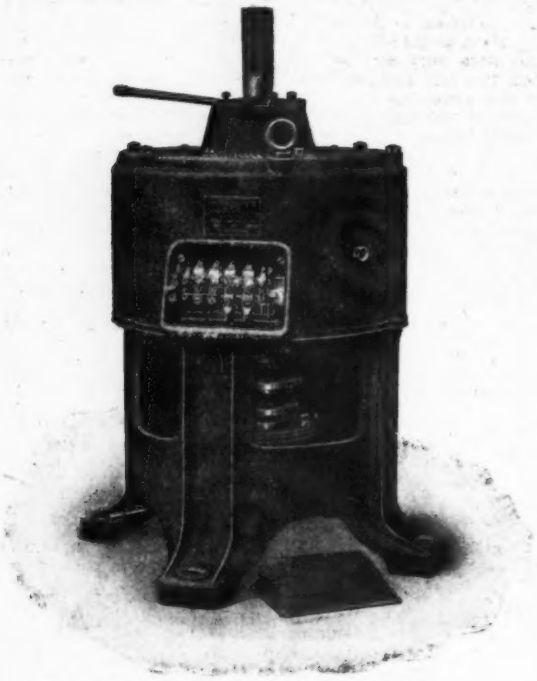

Fig. 2.—A 25-h.p., 10,000-r.p.m. Motor.

taking not only the weight of the armature, but also additional weight due to the machine being driven.

The commutation is said to be perfect although the machine is required to run at speeds varying from 5,000 to 10,000 r.p.m. by means of shunt regulation, and therefore at the higher speed the field is comparatively weak. The brush gear used is of the Mawdsley patent type, the commutator being fitted with three steel shrink rings.

### Machine for Grinding-in Diesel Valves.

The grinding-in of the valves of large Diesel engines is a long and arduous operation. In the confined space of the engine room of a motor ship the difficulty is accentuated, but MESSRS. CAMPBELL & ISHERWOOD, LTD., Raleigh Street Works, Liverpool, have produced equipment to make the task a lighter one. This consists of a pivoted beam which is attached in a

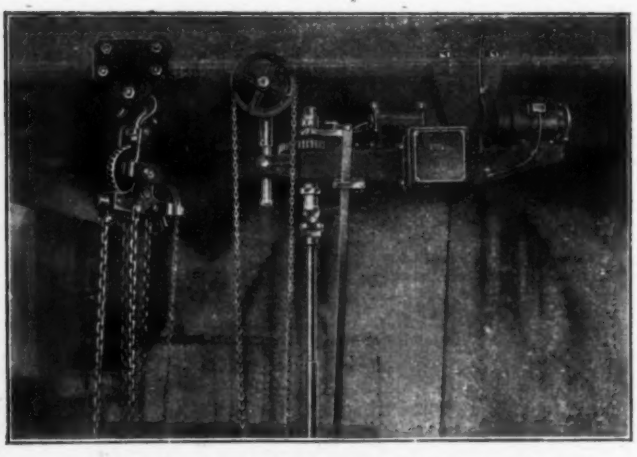

Fig. 3.—Grinding-in Equipment for Diesel-engine Valves.

suitable manner to the ceiling of the engine room. On this beam is a pulley block, the function of which is the removal of the valves from the engine to a stool arrangement in which the grinding-in shaft works. The beam also carries a motor which by means of a worm gear gives a reciprocal motion to the vertical shaft. A square-threaded shaft is attached to the beam support, and this raises and lowers the beam, and with it the grinding-in shaft, so as to give the necessary pressure on the valve seat. A chain and pulley wheel is used to move the square-threaded shaft. Fig. 3 shows the device as installed in the engine room of a motor ship.

## Correspondence.

***Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.***

### Single-phase Induction Motors and the Starting Problem.

As the oldest manufacturers of a.c. motors in this country (we started before polyphase existed in England), we should like to join the very interesting discussion raised by Mr. F. W. Davies in your issue of the 4th ult.

Speaking of the single-phase motor, Mr. Davies draws attention to its simplicity and the general sturdiness; we think this could be summed up better as its "continuity of service." A motor of exceptional efficiency which breaks down for two or three days readily causes its user more loss than he could have gained in a couple of years, from an extra one or two per cent. efficiency, although, naturally, a motor should show as high an efficiency as possible.

Two years ago we came across one of our single-phase motors sold in 1897, and still working in its original position.

Mr. Davies points out that the single-phase motor is rated lower for its size than a three-phase, his figure being 70 per cent. Probably this will be found a blessing in disguise at some future date, when most a.c. circuits will be three-phase for motive power, as it will enable single-phase motors to be readily rewound for at least the same, if not a larger, output.

Mr. Davies refers to motors running up to 1-3rd or 1-7th of the synchronous speed and refusing to go further. Although this could be due to harmonics introduced by the motor, it also occurs by reason of harmonics due to the supply, as most of the older makers of experience know. No maker of repute would send out a motor which false-synchronised, yet it is within our own experience to have had motors that would start perfectly well in one town and not in another, although the supplies were similar. In justice to the supply companies it should be stated that this was a good many years ago, when generators were not what they are now.

We can hardly agree with Mr. Davies that a no-volt release is an "unnecessary refinement"; you can, of course, rely upon the fuses, but the human element cannot be ignored. If the fuse has been blown frequently, by careless starting, it is apt in practice to be replaced by something very much too large. We have actually seen the clips that should have held a standard 25-ampere fuse occupied by a small spanner, a sample of a misplaced effort at "continuity of service."

Mr. Davies refers to the centrifugal friction clutch; this type of clutch has its uses, but we have never come across one that could be depended on. For general utility, he seems to have overlooked the hand-operated friction clutch and pulley on the motor shaft.

In conclusion, Mr. Davies says, in designing an electric motor, it is necessary to balance a number of more or less conflicting requirements. This is true, and applies to the installing of a motor or motors, for any particular job. A better service might often result if the consumers and contractors would consult more freely with the makers of the motors before deciding on the machine they think they require.

With reference to the starting of a single-phase motor, we fail to see why supply companies should concern themselves as to whether the motor being installed should be of the squirrel-cage or slip-ring type. If there was a standard regulation that the starting current should not exceed, say, 1½ times full-load current, it would give the consumer, in a number of cases, the opportunity of purchasing a much cheaper and more efficient motor.

**Brittain's Electric Motor Co.**
P. F. BRITTAIN.

London, *February 12th*, 1924.

### Self-Exciting Alternators.

While not disputing Mr. Contell's contention that a really practical form of self-exciting alternator would form a useful addition to the existing methods of converting mechanical energy into electrical energy, I am afraid that his proposals do not contribute towards a solution of the problem—mainly because the machine he describes is not a self-exciting unit.

The operation at double synchronous speed (either as a motor or a generator) of an induction machine when its stator and rotor windings are connected to the same supply is discussed by Arnold (Wechselstromtechnik V.1.). This appears to be the same thing as Mr. Contell describes in the ELECTRICAL REVIEW of February 8th, and such a machine depends on an external source for its supply of wattless magnetising kVA. which, together with the load current, is shared equally by the stator and rotor windings. The energy conversion is performed by the two members in parallel.

I believe motors have occasionally been operated in this way, but, as a generator, I fear that the machine is doomed to remain of academic interest only, as its only advantage over the ordinary type of induction generator is its ability to function at a speed of twice the synchronous speed of a two-pole field.

**Norman B. Hill.**

Hale.
*February 14th*, 1924.

### A Page-Printing Telegraph.

In your issue of February 8th, 1924, on page 208, you publish an illustration of a page printing telegraph which you describe as the "Carpentier Telegraph Printer," and you say that it has been developed by the firm of Carpentier, of Paris.

May I point out that this machine was not developed by Carpentier, and is not a Carpentier telegraph printer? It is the Morkrum page teletype, and it was developed by the Morkrum Company in Chicago.

Four of these machines have been running very satisfactorily on the *Dundee Courier* private wire between London and Dundee for the past six months. I have a letter from the Morkrum Company in Chicago in which they state that they have forwarded two of these machines to Carpentier in Paris for exhibition, and obviously it is one of these machines from which your illustration has been made.

I know Mr. Carpentier sufficiently well to realise that he would be the last man to claim credit not due to him, and the mistake has evidently arisen from the fact that the apparatus was described and illustrated by some journalist not familiar with the facts.

I may add that this new page printer works very well indeed at 60 words a minute, and I shall be happy to show it at my address to anyone who may be interested in it.

**Donald Murray.**

London, *February 12th*, 1924.

[Our representative in Paris wrote: "Le nouveau modèle qui vient de construire la maison Carpentier. . . ." We regret that, inadvertently, the Morkrum Company was not given due credit for the invention.—EDS. ELEC. REV.]

### The Punjab Hydro-electric Scheme.

I was told the other day that you had published a notice saying that it was understood that the Punjab Hydro-electric scheme had been dropped owing to lack of support.

I have not seen the notice myself, and I cannot say whether this is correct or not, but knowing that there has been a certain amount of opposition to this project by interested parties, it may interest you to know the facts, which are as follows:—

The original Sutlej project was not altogether suitable as a *preliminary* project for the Punjab, and this was pointed out by me to the Punjab Electricity Board at its first meeting in June, 1922. Arrangements had in the meantime been made to carry out a hydro-electric survey of the province, and the engineer in charge of that was in consequence instructed to examine the Beas and Ravi basins with a view to finding a more suitable site. This resulted in the discovery of the Uhl River site, with a maximum fall of 3,000 ft. and capable of supplying up to 111,000 kW by gradual stages.

After a preliminary examination, the Punjab Government decided to adopt this project and go ahead with it as fast as possible. The site was surveyed in detail during the winter of 1922-23, including 84 miles of metre-gauge railway, which will afterwards serve the Kangra Valley, a thickly populated agricultural valley badly in need of railway communications. The surveys were completed by the following May, and a detailed project was worked out last summer.

At my suggestion, the Punjab Government submitted the whole scheme to the scrutiny of three committees specially appointed for the purpose:—

1.—To examine the hydraulic and civil engineering proposals;

2.—To examine the railway proposals; and

3.—To examine the project as a whole from the financial point of view, with special reference to the estimates of revenue and working expenses.

These committees have completed their work and sent in their reports, which are entirely satisfactory.

The whole scheme, including the reports of the three committees, is now being submitted to one of the leading firms of consulting engineers in London for final examination, and if their report is satisfactory, work will probably commence next autumn.

As there are a number of persons interested in the future of this project both in India and England, you may care to publish the above facts in one of your forthcoming issues.

**B. Battye,**
Lt.-Col., R.E.,
Superintending Engineer, Hydro-Electric Circle.

Simla, India.
*January 31st*, 1924.

### Two-way Pendant Switch Flexibles.

With reference to the correspondence in your recent issues on the above subject, may I state a few facts which I have previously endeavoured to impress upon other interested parties.

An ordinary lamp circuit consists of one lead direct from the supply to the lamp and another lead arriving at the lamp via a s.p. tumbler switch.

The current in a circuit is limited, at constant supply pressure, only by the effective resistance of the circuit. It is mostly quite unimportant what piece of apparatus forms the bulk of the resistance in any circuit, but in this case we are considering lamps.

The point that I wish specially to make, because it is not fully appreciated by those concerned, is that, if a voltmeter be connected across the terminals of the switch, while it is open, it will indicate the supply pressure. In the ordinary way this is the most accessible point for the purpose of measuring the voltage, and it is where I invariably do it. The resistance of the lamp, or lamps, is not effective to the voltmeter, which would take about 25 mA.

It follows, therefore, that the effective resistance (Ohm's law) of a circuit is zero when the circuit is broken and that the supply pressure exists at the terminals of the switch that breaks it.

The only function of the lamp in the circuit is to limit the current.

The flex leads to a pendant switch are for the above reasons subject to full supply pressure between them when the switch is open. Assuming that the lamp takes 1 amp. and that both flexible leads have become damaged—we then have the necessary conditions for the development of an arcing contact. When one recalls that a lamp takes seven times normal current when cold, it is realised that the conditions are ideal for the production of a fire, namely, 7A, and at the supply pressure. There is also another possible source of ignition to the flexible—that due to overheating and burning out at a point in one of the leads.

In a given electric circuit the conditions are the same no matter where the circuit be broken. Fuses, of course, offer no protection.

**G. L. Payne.**

Wallingford.
*February 16th*, 1924.

### Squirrel-cage Motors of over 5 h.p.

Mr. Howe's letter contains the standard arguments of the supply engineer, and some of his points are easily answered. If "the ratio of the power load (largely inductive) to total load is ever increasing," then if the supply companies are "looking ahead," as suggested by Mr. Howe, ought they not to be making some arrangements in their own supply stations to improve their power factor, in the face of this anticipated larger percentage of inductive load?

Again, does Mr. Howe contend that a 7½-h.p. motor on certain mains in the West Riding of Yorkshire is going to cause a kick on all the lights in the neighbourhood? It will also occur to many that "to sell power" it may be considered worth while to make the initial outlay for the consumer as small as possible, and at the same time allow him to use a motor which has the fewest possibilities of breakdown.

Regulations, however, do not in many cases finish at the motors. Control gear for a.c. machines is in an equally unsatisfactory position. Compare the price of a star-delta starter (non-automatic) which can be used on many supply systems for motors between 5 and 15 h.p. with that of an air-break stator and rotor starter with a no-volt and three overload releases required in other cases.

It appears to the writer that this is a point requiring some measure of standardisation. In this connection will some supply engineer or control gear expert state his objections (if any) to control gear for slip-ring machines up to, say, 25 h.p., taking the form of a triple-pole switch-fuse in conjunction with a rotor starter having a no-volt release? A combination of this sort gives the cheapest fully protected job, and the rotor starting handle comes back to the "off" position on failure of voltage or when the fuses blow. The chief drawback mentioned to the writer during some arguments on this subject is the danger of only one fuse blowing, and the motor single-phasing indefinitely, presumably without blowing the other two fuses, which seems just a little difficult to believe. Finally, will some gentleman inform us of the advantages of a rotor starter with overload releases?

Many re-adjustments are necessary to bring a.c. regulations into line; obviously the advantages of one minimum standard for stations up to certain capacities would be enormous both to consumers and manufacturers, and, the writer has faith to believe, to supply undertakings themselves.

**J. H. Ward.**

Leeds, *February 13th*, 1924.

With reference to recent discussions on the starting of squirrel-cage motors, I venture to think it may be of interest to point out that in the February issue of *World Power* I have shown that, by the use of static condensers in series with the stator windings, such motors may be started up with full-load torque without drawing an excessive current from the line.

When static condensers, either of the paper-insulated type or of a liquid type, are used in series with the stator winding the running characteristics of the motor are improved; that is, not only is the power factor increased, but the efficiency is somewhat increased and the slip is reduced. The overload capacity is also increased.

When a rebate in the price of electricity is allowed for the improvement of power factor, it may pay to provide static condensers for this purpose. If the condensers are then connected in series with the stator winding of the motor instead of in parallel as is the usual practice, a squirrel-cage motor can be used and started up with full-load torque.

If no rebate is allowed for power-factor improvement, the expense of static condensers for starting may be avoided by building up the rotor winding of composite conductors as described in a paper read before the recent British Association meeting in Liverpool and published in the ELECTRICAL REVIEW in October last.

**T. F. Wall.**

Sheffield.
*February 16th, 1924.*

### Electric Water Heating.

During the discussion on Mr. Nobbs's paper, reported in your current issue, we notice that the remark was made that stations could attain 100 per cent. load factor, if there was an appliance which would switch off the heating at times of peak load.

This can be done by means of the "Olipel system of distant control," which gives station engineers complete control of apparatus on the mains.

In connection with "electric water heating," the heating load could be switched off at different times daily to suit the variations in peak-load times. The special switches are connected to the network, and are operated from the station by means of the Olipel station control.

We feel that this information may be of interest to some of your readers.

**Oliver Pell Control, Limited.**
C. OLIVER, *Director.*

Woolwich, *February 12th, 1924.*

### Electric Passenger Lifts.

Mr. T. W. Burdes, in your issue of February 8th, says that I must surely be aware there are several lifts in London running at speeds of over 400 ft. per minute.

I have not this information, and should be greatly obliged if your correspondent could give me the particulars. I have not the specification of the lift in Marconi House, but it does not appear to me to be running above the speed mentioned.

For experimental purposes I have myself used speeds up to 700 ft. per minute, but for permanent installations 400 ft. per minute has been the limit.

**H. Marryat.**

London, *February 13th, 1924.*

### Plumbing Joints.

One correspondent has replied to me direct on this subject, and I enclose a copy of his letter for publication.

Prescot. **R. Welbourn.**
*February 15th, 1924.*

COPY.

*Apropos* of wiping joints, I had an interesting conversation with an expert plumber, who gave me what seems to be quite a good reason. He explains that the habit has arisen from a misconception by most plumbers that the doing so prevents sweating, but it has the advantage of making the joint look as a finished joint to any plumber who takes a pride in his work, by removing any finger marks, which invariably get on the hot lead, and it also removes the blacking or other material used by many for lining the joint. In his case he invariably uses it for the purpose of giving a finished tone to his work and prevented a lead pipe being painted in cases where he had done so.

One or two others that I have mentioned it to expressed the view that it was to hide defects or leaks or possible leaks, but admitted that it was useless for this purpose.

When an expert like Mr. Welbourn writes from the very "cradle" of plumbed joints in the paper-insulated lead-covered cable industry, one must with keen diffidence approach the subject in reply. In the days when blowpipe solder was used in blowing the now almost extinct hand-made spigot and socket joint in lead water pipes, the genuine craftsman, on completion of the blow, and whilst the joint was still hot, rapidly went over his joint with a piece of composite candle (not tallow), *i.e.*, the predecessor of the common commercial wax candle of to-day. On rapidly wiping off the hot grease a beautiful soft sound finish was obtained and all trace of the rosin used as flux was removed, and a pin-hole or defect was easily discerned by the eye of experience. If Mr. Welbourn can find a living member of the old B.I. jointing staff of the Victorian era, he will hear a lot about metal being too fine or too coarse, and the effect of applying chalk to the tallow-soaked moleskin wiping cloths or pads, kept in a sacred zinc box of modern tobacco tin geometrical proportions.

Apart from spotting the presence and proportion of tin in running molten "plumbers' metal," the old hand undoubtedly discerned defects in his metal mixture, whether the metal was too cool (short), when the wipe was all but completed. By the rapid melting of a candle and tallow on a freshly wiped joint not only is the final appearance improved, as a finish is produced akin to good "mat black," or to coin an expression I will term it "mat gray," but also blemishes are magnified thereby. The object was to show up defects rather than to plug pin-holes or faults by artifices or camouflage.

The jointer of to-day apparently anoints his finished wipe with tallow simply because old Joe, whom he used to mate, did it, but I fear our friend of to-day does not read the evidence as old Joe did 20 or 30 years back.

If Mr. Welbourn is sufficiently interested, he will find some further ramblings *apropos* of this subject in the ELECTRICAL REVIEW of July 21st, 1911, by his humble servant

London. **Walter E. Rogers, A.M.I.E.E.**
*February 17th, 1924.*

### A Libel on the Megger.

In the ELECTRICAL REVIEW of January 18th, we have seen Mr. Evershed's explanation of the action of a Megger when used for testing porcelain insulators in a humid atmosphere, and we can only express our appreciation of the clear and intensely interesting way in which he explains the matter. It surely was not the intention either in our paper, in Mr. Matthews's review of it, or in the original from New Zealand to give the impression that the Megger gave an untrue reading of the combined insulation resistance of an insulator and its enveloping film of moisture (the Megger is always right so long as it is in good order), but simply to point out that under humid conditions it gives a result that is useless to the operating engineer, as the leakage is then so heavy that the true insulation resistance of the insulator is completely disguised. We, who are testing insulators to assure the service on our transmission lines, must know the insulating value of the porcelain itself, and we can only get it with a Megger when the enveloping film of moisture is so thin as to have a negligible effect on the result. The Megger can only give the *total* resistance as it exists at the time of test; hence the man who is trying to ascertain the condition of the insulator itself must be certain that the test conditions are right, otherwise he may get a result that, although perfectly true, is at the same time perfectly useless. We have found by experience in using the Megger that good results can be obtained only by observing the precautions indicated in "the scholarly paper by Messrs. Farr & Philpott, who have investigated the matter rather carefully," and hence in discussing the insulator problem we mentioned the difficulties of such measurements, because we believe that the useful results of such investigations should be made public, with due credit given to the proper parties (even though they live in far-away New Zealand) regardless of whether the truth helps or hinders the sale of any particular article or instrument.

**C. E. Bennett,**
*Acting Chief Engineer,*
Barcelona, *February 12th, 1924.* Riegos y Fuerza del Ebro, S.A.

### What is a "Megger"?

I read Mr. Borlase Matthews's letter in your issue of February 1st with some surprise, and have waited to see whether any of your readers confirmed his view before venturing to give an answer to his question.

Can it really be that after twenty years of education (for surely the perusal of the advertisements and publications of my company must be so regarded) only ten per cent. of electrical men know what the word *Megger* means?

A Megger is a combined ohmmeter and generator designed for the measurement of insulation resistance. The execrable name, as we at first thought it, was an invented one (*culpa mea*); and having been long since registered as a Trade Mark, denotes an instrument made by Evershed & Vignoles, Ltd.

From the fact that the Evershed testing set was the first of its kind, from the long monopoly it enjoyed, from its wide-spread use, and from the extensive advertisement which we gave it, the word *Megger* sank into the language of electrical engineers and came to be applied (incorrectly) to any insulation testing set, much as *Kodak* is used loosely for any hand camera.

**E. B. Vignoles.**

London.
*February 15th, 1924.*

### Salesmanship.

The letter of "M.I.Mech.E." in your issue of this week confirms a long-standing suspicion of the writer's.

Salesmanship has undoubtedly been oversold. We have overlooked the fact that not only salesmen, but also buyers—the salesman's natural prey—are readers of papers like the ELECTRICAL REVIEW.

In vain is the net spread in the sight of any bird. When I take the road to-day it is my intention to leave salesmanship behind, and as I near the caudal appendage of the wary biped I intend to charge my verbal salt-cellar with a humble and disarming appeal on something like the following lines:—"I have really secured this interview on false pretences. I know nothing about salesmanship, and my firm's only excuse for sending me to see you is that I know something about the plant you want."

By the time this letter appears in print my firm will doubtless either have booked enough orders to keep it busy for the rest of the year, or will have dispensed with my services. So no harm can result from its publication.

**Venditor ignotus.**

*February 15th, 1924.*

### Electric Motors at Wembley.

There are usually two sides to a question, and I think it should be pointed out that the authorities at Wembley do not absolutely prohibit the use of any type of motor, even the most modern, but only say, in effect, "You can use modern methods if you like, but if you do, you will be fined £50." This no doubt is annoying to the exhibitors, but there is really something to be said for it. Wembley is, after all, a British Empire Exhibition, and the British Empire includes England, and England includes officialdom, and officialdom includes a reverence for the past, particularly for past rules and regulations. Now, if we sweep all these away, how is the oversea visitor to realise that he is in England at all? There is no doubt that a large number of our visitors expect to step straight into a "Dickens" atmosphere immediately they set foot in London, and they should not be disappointed. Now, no electrical manufacturer objects to part of the Exhibition illustrating the past, and an "Old London" Section is of interest to everyone; but his objection is that some official—probably a quite well-meaning and sincere antiquary—has got slightly muddled up between the "Old London" and the Electrical Engineering Sections of the Exhibition.

Let the Exhibition authorities realise that the two things are quite separate and distinct, and say—"Nothing modern in Old London, everything modern in Engineering," and then everyone will be satisfied.

**Exhibitor.**

*February 18th, 1924.*

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Letters which cannot be inserted in this issue have been received from "D.P.," "Progressive," "C.A.B.," "Observer," Mr. Nelson Jones, Mr. F. M. Gillespie, and Mr. Frank Gould.

Mr. J. E. Savidge has omitted to give us his address. Will he kindly write us again?

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# A Non-Technical Explanation of Power Factor.—II.

## Results of the Electrical Apparatus Co.'s Competition.

### Mr. R. D. Reynolds.

Imagine a horse to be pulling a railway truck at four miles per hour. To do this it will be necessary for the horse, walking between the rails, to exert a definite pull on the truck.

If the condition of the surface between the rails is such as to impede the animal's progress, it will be necessary for him to walk on one side of the truck. In order to move the truck at the same rate, or to do the same amount of useful work as before, it will now readily be seen that it will require greater exertion on the part of the horse.

If anyone doubts this fact, it can be easily proved by a simple experiment, *i.e.*, attach a rope to a light motor car and try towing it when in front, and with various displacements to the side. In the extreme case, the pull would be at right angles to the vehicle, when it would of course cease to move; in other words, no useful work would be done.

To give a mathematical representation of this, we will say that in the ideal case the power factor is 100 per cent., *i.e.*, when the horse walks between the rails, and the whole of the pull represents useful work. In other cases, where the horse is farther away from the track the power factor will be represented by 80 per cent., 75 per cent., and so on, depending upon the pull which has to be exerted by the horse in order to move the truck at four miles per hour; representing a definite amount of useful work. In one instance we imagined that the condition of the surface between the rails was such as to impede the progress of the horse, so that he could not work at 100 per cent. power factor.

Analagous conditions exist in the case of induction motors: some have more electrical impedance than others. Where the impedance is great the power factor is low, and a great deal more current is necessary to achieve the result of doing a definite amount of useful work, in the same way that the horse in some cases has had to do more pulling to accomplish the result that would have been done more easily if there had been nothing to impede his progress between the rails.

When working at approximately three-quarters to full load, good motors run at a high power factor, poor ones at a low power factor. When lightly loaded, induction motors, generally speaking, run at a low power factor; so that this should be avoided as much as possible.

Use good motors, and don't use a 10-h.p. motor when a 5-h.p. one will meet your requirements.

The lower the power factor of your motors the greater will be the amount of current required from the power company; much of it, current that is not doing useful work, which is not taken account of by your watt-hour-meter (or energy meter). Hence in many cases the supply authorities penalise consumers who take current at a low power factor.

A poor power factor puts many disadvantages on to the supply undertaking, one of them being that its machines and cables, which are rated to carry definite amounts of current only, become loaded up with a lot of current which is idle, or not doing useful work: thus restricting the supply to other users, and necessitating an expenditure of more money on cables and machinery in order to increase the supply of electrical energy.

### Mr. W. S. Jordan.

The electrical circuit has no counterpart in the ordinary mechanisms one is used to, but let us stretch our imagination slightly to adapt some simple illustration to our needs. Let us bring to our aid the ordinary household water tap, with one alteration in the nature thereof. Assume that, instead of obtaining a constant flow of water, there came from the tap a periodic discharge—a small stream of short duration, a lapse for a brief period of time, then another flow of water, and so on. Now consider that, utilising this regularly intermittent flow and a small cup, the work we wish to do is to fill up some larger vessel. We proceed in this by bringing our cup alternately to the tap and the vessel, completing the double journey in exactly that time during which no flow comes from the tap. It is apparent that, by arriving at the tap in time to catch *all* the flow, with the amount of water at our disposal, we shall be doing maximum work in a given time, or our *power* is a maximum. This power we shall call 1.

Now the periodic motive force moving our cup to and fro can be likened to the alternating motive force in the electric mains—the voltage. Similarly is the periodic flow of water equivalent to the flow of electric current—the amperes. In a similar way to our analogy, when we utilise *all* the flow of electric current our power is a maximum, shall we say equal to current flow multiplied by 1.

Consider now that, in bringing the cup to the tap, it lagged behind so that it arrived in time to catch only half of the flow. Naturally, as both the periods of flow and the oscillations of the cup are of the same number per minute, the next time it arrives at the tap it will still only catch half. In other words, the cup's motion is so displaced from being attuned with the rhythm of the discharge that but half of the flow is utilised. In this case you will take twice as long to fill your vessel, or, putting it another way, your power will be half. Assuming your power was previously equal to the flow multiplied by 1, it is now equal to that same flow multiplied by ½. This multiplying factor is what may be called the power-factor of working, and is quite alike to the power-factor of an electrical circuit. The inherent nature of many electrical circuits is that the electromotive force (the motion of the cup) and the current (the flow of water) are displaced from one another in point of time. Assuming that the displacement is as bad as that in our water example (only utilising half of the flow) our power will not be measured by the flow of current, but by that current multiplied by a power-factor of ½. In some circuits the displacement may be, by its own nature, less or perhaps more and the multiplying factor may vary, say, from 3/10ths to 9/10ths.

How does this affect the cost of delivering the current necessary for full power? Returning to our analogy it will be understood that, in order to obtain the rate of filling the vessel attained in the first instance and still lag behind with the cup, we should require two taps and two cups—double the facility for bringing water to the vessel. In electrical terms a power factor like this of ½ means two cables or a cable double the size. This, of course, means greatly increased cost of supplying energy.

By bringing the cup into step again with the flow of water and thereby catching all of it, the cost of laying on two taps is avoided. Similarly, by adjusting the nature of the electrical installation so that the current taken and voltage of the supply mains oscillate absolutely in step, the required cable is much less expensive. The installation of any apparatus to gain this end reduces the cost of supplying power. The securing of a unity power factor (power equals current multiplied by 1) should and will react on the consumer in lower electricity charges. On the other hand, it is only equitable that the consumer with a bad power factor and needing much larger cables than the other should be called upon to pay the extra cost of supply for which he himself is responsible.

### Mr. R. Amberton.

A manufacturer sells his product to various classes of customers and, as a general rule, at varying prices.

For example, a customer A who places large firm orders for delivery spread over the slack season is a very valuable customer and can negotiate keen prices. On the other hand, a customer B, who places orders on a sale or return basis and, when placing a new stock order, always returns a proportion of unsold stock, is more expensive to supply and cannot expect the same terms.

It is clear that if B always takes more goods than he is going to retain, the manufacturer is out of pocket in the following ways:—

(a) He has to have additional capital to finance the extra stock.

(b) He is prevented from selling the extra stock to someone else when opportunity arises.

(c) If free delivery is included, he has the trouble and expense of delivery and collection.

It is obvious that the manufacturer cannot expect payment in full for the extra stock he has to maintain for customer B, but it is equally certain that in the long run he will not supply B on as favourable a basis as A.

It is much the same with electricity supply. Some electric motors take more current from the mains than they actually use. The unused part (called idle current) they return to the mains. To keep such a motor running involves larger generators, switchgear, cables, transformers and greater distribution losses; in addition, the supply authority is prevented from making full use of its plant, and thereby making a profit on the whole of the output.

The term "power factor" is used to express the proportion of the total current taken, which is converted into mechanical power. If there is 25 per cent. of idle current returned by the motor, the power factor is 0.75.

Motors having a good power-factor cost rather more than those with a low power-factor, but pay for themselves in time through reduced power charges. Induction motors which are too large for the work they have to do always have a bad power factor.

However bad the power factor of an installation, it can always be improved by installing special apparatus for the purpose.

### Mr. L. Dalton.

Imagine a cyclist on a fixed-wheel machine is propelling himself forward by exerting an even pressure on each pedal alternately from its highest position to its lowest; useful work will then be done during every moment that he is exerting the pressure.

The electrical equivalent of this state of affairs is: The cyclist represents the generator which supplies a.c.; the cycle represents the current-consuming apparatus; and the pressure exerted on the pedals represents the electrical pressure, *i.e.*, voltage. One complete revolution of the pedals represents one wave, or alternation of current or power (technically termed a cycle or a period).

One wave of pressure is made up of two impulses, one with the right leg and one with the left, and useful work is being done during each ½ period by each leg alternately, and varies from nothing at the top position (which we will call the beginning of a period) to a maximum after a ¼ of a period, *i.e.*, the pedal half-way down, and to nothing again after a half period or pedal at the bottom. Then the same conditions occur during the next half period as the other pedal goes on its downward stroke. Thus, there is one instant of no work between the two impulses when one pedal is at the top and the other at the bottom. This represents alternating current at unity power factor, because the whole of the pressure is doing useful work during each half period during which it is applied.

Now suppose the cyclist only begins to press on the pedal some distance after it has passed its top position, and maintains that pressure for an equal distance after passing the lowest position, that is, on a portion of the upward stroke. Owing to the momentum of the cycle, the pedals will now exert a back pressure and force each leg up in turn against the downward pressure which is being exerted. In other words, the bicycle will now be doing work and giving back some of the energy previously imparted to it. The net result is a lower travelling speed, although the cyclist is expending just as much energy. Now, between the two useful impulses of work which will now be of shorter duration, there will be a short interval of negative work, which means that the bicycle itself is giving back power to the cyclist, which he is, of course, unable to use for any useful purpose as it is expended in merely raising the foot which he is still trying to press down. This is equivalent electrically to a condition of less than unity power factor, for although the apparent work done is the same, *i.e.*, the cyclist is exerting the same pressure through the distance or half period, the actual useful work is less as shown by the reduced speed of the machine. Now nearly all electrical apparatus will generate a back pressure or back voltage (technically known as self induction) when alternating current is applied to it. The net result is that the apparent power is greater than the actual power, and between the two half-period impulses of power there is an interval during which the apparatus is actually giving up power as in the case of the bicycle. This power is useless; in fact, it is harmful. As the cyclist had to exert himself more to maintain the same speed, so do the power station and cables have to carry a heavier current when supplying low power factor apparatus than when doing the same work at unity power factor. This excess current is called wattless current and it loads up the generator and cables of the supply authority, to the exclusion of prospective customers, until extra generating plant or cables are put down—a very costly business.

On the other hand, if customers' power factors were good, that is, approaching unity, the wattless current would be small, and additional customers could be connected without spending money on extensions.

# Published Specifications.

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'DELL, AND STEPHENS, Patent Agents.

The name of the applicant's patent agent, if any, will be found on the printed specification.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

### 1921.

29,512. "Alternating-current electric motors." F. Contell. July 25th, 1922. (209,848.)

30,372. "Alternating-current electric generators." F. Contell. July 25th, 1922. (210,097.)

### 1922.

20,579. "Controllers for electric generating plants." Ward Leonard Electric Co. July 25th, 1921. (183,839.)

25,370. "Switch handles or similar forms of switch mechanism particularly adapted for use with portable electrically-operated tools, such as drills and the like." A. E. White (Independent Pneumatic Tool Co.). September 18th, 1922. (210,113.)

25,911. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. January 30th, 1922. (192,036.)

28,155. "Electrical switchgear." J. A. Hirst and Brook, Hirst & Co., Ltd. October 17th, 1922. (210,126.)

28,163. "Electric riveting machines and processes." G. B. Ellis (T. F. Murray). October 17th, 1922. (210,128.)

28,897. "Thermionic valve transmitters for wireless telegraphy." L. G. Preston, G. Shearing, and C. Matthews. October 24th, 1922. (210,142.)

28,898. "Electric heaters for running water." J. Bousie. October 24th, 1922. (210,143.)

28,959. "Systems of electric ship propulsion." British Thomson-Houston Co., Ltd., and F. A. Haigh. October 24th, 1922. (210,145.)

29,005. "Electric trip switches." W. C. Priestley. October 25th, 1922. (210,150.)

29,075. "Electric wall plugs." A. Reyrolle & Co., Ltd., and H. F. Secretan. October 25th, 1922. (210,155.)

29,192. "Electrical resistances." W. F. Chalker, junr. October 26th, 1922. (210,163.)

29,335. "Electric switch-boxes and the like." A. Reyrolle & Co., Ltd., and J. Mirrey. October 27th, 1922. (210,169.)

30,075. "Electric switches." A. H. Railing, C. C. Garrard, and W. Wilson. November 3rd, 1922. (210,186.)

30,833. "Transmitting and receiving apparatus for type-printing telegraphy." P. Lindet. December 1st, 1921. (189,765.)

31,667. "Telephone receivers." A. C. Brown. November 20th, 1922. (210,212.)

32,838. "Automatic electric-current regulators." W. Langdon-Davies and A. Soames. December 1st, 1922. (210,227.)

33,102. "Systems of electric motor control." British Thomson-Houston Co., Ltd., and R. D. Given. December 4th, 1922. (210,229.)

33,493. "Systems of electric motor control." British Thomson-Houston Co., Ltd., and R. D. Given. December 7th, 1922. (210,236.)

33,691. "Grid leaks and like electric resistances." A. E. Chapman. December 9th, 1922. (210,238.)

33,844. "Electric ignition distributors, commutators, and the like." J. S. Foley. December 12th, 1922. (210,242.)

33,862. "Means for preventing theft or unauthorised removal of electric lamp bulbs." J. A. Brook. December 12th, 1922. (210,243.)

34,182. "Electromagnetic sound receiving and producing devices." C. W. Clarabut. December 14th, 1922. (210,244.)

35,192. "Illuminating devices." British Thomson-Houston Co., Ltd., H. C. Wheat, and W. Milliner. December 27th, 1922. (210,253.)

### 1923.

40. "Electric arc-welding and apparatus therefor." W. Langdon-Davies and A. Soames. January 1st, 1923. (210,254.)

456. "Dynamometers." British Thomson-Houston Co., Ltd. (General Electric Co.). January 5th, 1923. (210,255.)

599. "Aerial wires for radio reception in combination with a lightning protector." C. V. Morris. January 8th, 1923. (210,257.)

1,319. "Head-lights for motor vehicles." A. Gaygal. January 16th, 1923. (191,751.)

2,498. "Starting and speed-control of electric motors." A. H. Railing, C. C. Garrard, and W. Wilson. January 27th, 1923. (210,282.)

2,928. "Aerials for wireless signalling." Continental Automatic Telephone and Electric Co., Ltd. (Telephon Fabrik Akt.-Ges. vorm. J. Berliner). January 31st, 1923. (210,287.)

4,324. "Igniting mechanism for the engines of Ford cars." Ipswich Industrial Co-operative Society, Ltd., and A. Gamblin. February 16th, 1923. (210,299.)

5,869. "Machine for tightening and smoothing layers of insulating material wound on spools and bars of electric machines and apparatus." E. Haslely et Cie. Akt.-Ges. March 9th, 1922. (194,690.)

7,210. "Fuel injection and ignition devices in internal-combustion engines." G. Leidenroth. March 29th, 1922. (195,609.)

7,259. "Electric battery cells." Soc. Anon. Le Carbone. May 4th, 1922. (197,301.)

7,651. "Electric accumulators." Chloride Electrical Storage Co., Ltd., and H. Dean. March 16th, 1923. (210,316.)

8,990. "Electric vacuum-tube apparatus." Soc. Anon. Pour l'Exploitation des Procédés M. Leblanc-Vickers. April 22nd, 1922. (196,595.)

9,328. "Electrically conductive clips." H. E. Walker. April 5th, 1923. (210,323.)

12,064. "Electric switches." P. R. Coursey and Dubilier Condenser Co. (1921). Ltd. May 4th, 1923. (210,337.)

14,378. "Automatically-operated voltage regulator." M. Kinoshita and W. W. Nobbs. May 31st, 1923. (210,346.)

16,772. "Electrical control for mechanisms for setting or displacing a tool or other device by a predetermined amount." J. R. C. August and E. E. Hunter. September 15th, 1922. (Divided application on 200,127.) (210,365.)

17,035. "Telephone receivers." G. W. Walton. July 2nd, 1923. (210,368.)

17,270. "Transformers with clamped concentric coils." Akt.-Ges. Brown, Boveri et Cie. July 6th, 1922. (200,507.)

18,062. "Dynamo-electric machines." A. J. Smith. July 28th, 1922. (201,543.)

18,316 "Electric-multiplex communication." T. Oguti. August 17th, 1922. (Addition to 190,442.) (202,622.)

24,856. "Acceptor or rejector circuits in alternating-current systems." Ges. für Drahtlose Telegraphie. October 13th, 1922. (205,485.)

**Lamp Makers Visit America.** — Representatives of European incandescent electric lamp manufacturers are touring the U.S.A. for the purpose of studying American lighting practice and methods. They will spend two months in the country, and will visit Niagara Falls, Cleveland, Chicago, Detroit, Newark, Schenectady, New York, Boston, and Washington. In a photograph reproduced in the *Electrical World* can be seen seven representatives from Great Britain and one from Germany, while it is stated that others from France, Spain, and Italy had to abandon the trip at the last moment.